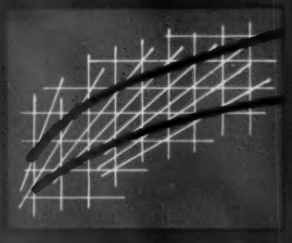
# FOUNDRY

DECEMBER
1956
Vol. 84 #12
A PENTON PUBLICATION

## Risering of Nodular Iron



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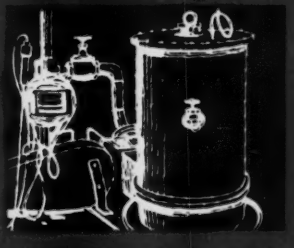

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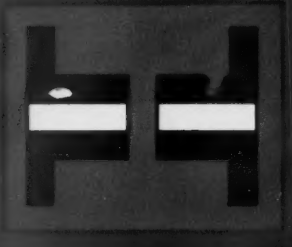

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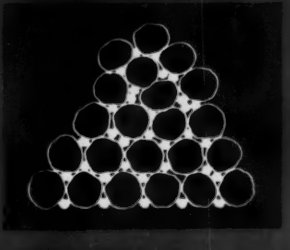

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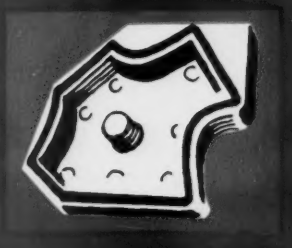

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# how to assure sound finished castings

***Here are results proved by leading foundries from using Purite fused soda ash.***

**Sulphur control:** Purite reduces sulphur content to a specified allowable per cent. When price or shortage forces the use of high sulphur scrap, you can still turn out quality castings.

**Less bridging:** Purite flux in the cupola increases fluidity of the charge, insuring better mix of materials, hotter melting and uniformity of process and product.

**Economy:** Purite is 100% fused soda ash; contains no inert waste. The solid two-pound pigs all go into the mix; none of it blows away as lost dust.

**Convenience:** Purite pigs are non-crumbling two-pound blocks. Handle easily. You measure out what you want simply by counting. Store indefinitely without loss.

**Supply:** Leading foundry supply houses distribute Purite in every area. For the name of your nearest supplier or for more information, please write—

MATHIESON

MATHIESON CHEMICALS
OLIN MATHIESON CHEMICAL CORPORATION
INDUSTRIAL CHEMICALS DIVISION • BALTIMORE 3, MD.

3598

Circle 551 on Inquiry Card—Page 217

# Meets *many* needs of power plant castings with a single 2.0% Nickel iron

"When I called at the Hardin Foundry", said Chuck Wright, Inco Distributor Foundry Specialist, "Al Grant was hip-deep in blueprints and shaking his head."

What troubled Al was an order for ¼-million pounds of power plant castings: condenser boxes, pumps and valves. He wanted one basic iron to meet the somewhat incompatible requirements of all.

For example, the condenser boxes (5′ x 9′6″ x 9′6″) called for a dense iron with a minimum strength of 35,000 psi. Plus resistance to corrosion.

The pumps (42,000 lbs. total weight) had to meet strength requirements of 40,000 psi, test pressures of 35 psi . . . *and* have good corrosion and erosion resistance.

The 15-foot-long reversing valves demanded strength as high as the pumps and extra wear resistance for the seats.

"You can meet all the requirements with nickel," I said. "A good basic iron of 3.0 to 3.2 carbon aiming for 1.6 silicon and 2.0% nickel will do it."

A 2.0% nickel iron provides the strength and density needed for all these castings. The graphite refinement brought about by nickel aids corrosion resistance. It also gives the hardness needed for erosion and wear resistance.

"With nickel iron," I said, "you should be able to maintain good structure uniformity in both heavy and light sections. And even though the iron is dense and hard you'll get the machinability you want."

The suggestion was all that Al needed. With this 2% nickel iron plus the good casting practices that prevail in his shop, he was able to handle the job easily.

When you have a problem in the metallurgy of castings, call me over. You may not have the same problem as Al Grant. But I'll be glad to help. No matter how large or small your foundry. You can reach me at Inco.

*Chuck Wright*

The International Nickel Company, Inc.

67 Wall Street New York 5, N. Y.

# ALCHEMY WON'T WORK ON BENTONITE *either!*

During the Middle Ages, alchemists worked in vain to discover the secret of transmuting common metals into gold. *Modern day alchemists* are no more successful in their efforts to produce a *satisfactory* low-viscosity-bentonite from clays that do not possess this desirable quality. It is true that adding certain chemicals to bentonite will lower its viscosity. *But,* this "alchemy" also lowers the durability of bentonite, so it burns out faster, losing its ability to develop green and dry bond strength.

Federal uses no "alchemy" in the production of Federal GREEN BOND Bentonite! It doesn't have to — for low viscosity ★ is a *natural* characteristic of the bentonite clay from which Federal GREEN BOND is produced. Federal engineers test-drill bentonite deposits *before* mining — select *only* those lots with natural low viscosity for the production of Federal GREEN BOND Bentonite.

Federal GREEN BOND, therefore, is a pure mineral product — *unadulterated, untreated.* And, because it is free of harmful chemicals, its durability is unimpaired, its ability to develop high green and dry strength retained much longer.

So, don't take a chance on "alchemy" — when you can *depend* on Federal GREEN BOND — the best of the bentonites. (Write for your copy of "Tailor-Made Molding Sands".)

## *The* FEDERAL FOUNDRY SUPPLY *Co.*

4600 EAST 71st STREET
CLEVELAND 5, OHIO

★ Federal GREEN BOND'S low viscosity enables users to temper sand with less water, get optimum strength with less mulling time, when "dry ad-mixed" to sand. When used as an additive to "slurry", up to 25% more GREEN BOND may be added to the water, to produce a more potent slurry and provide easier control of moisture and sand strength.

**AVAILABLE IN PULVERIZED, GRANULAR AND *quick-dispersing* SLURRY GRADES**

FOUNDRY
A PENTON PUBLICATION

December 1956
Volume 84—Number 12

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(For addresses of branch offices, see page 269)

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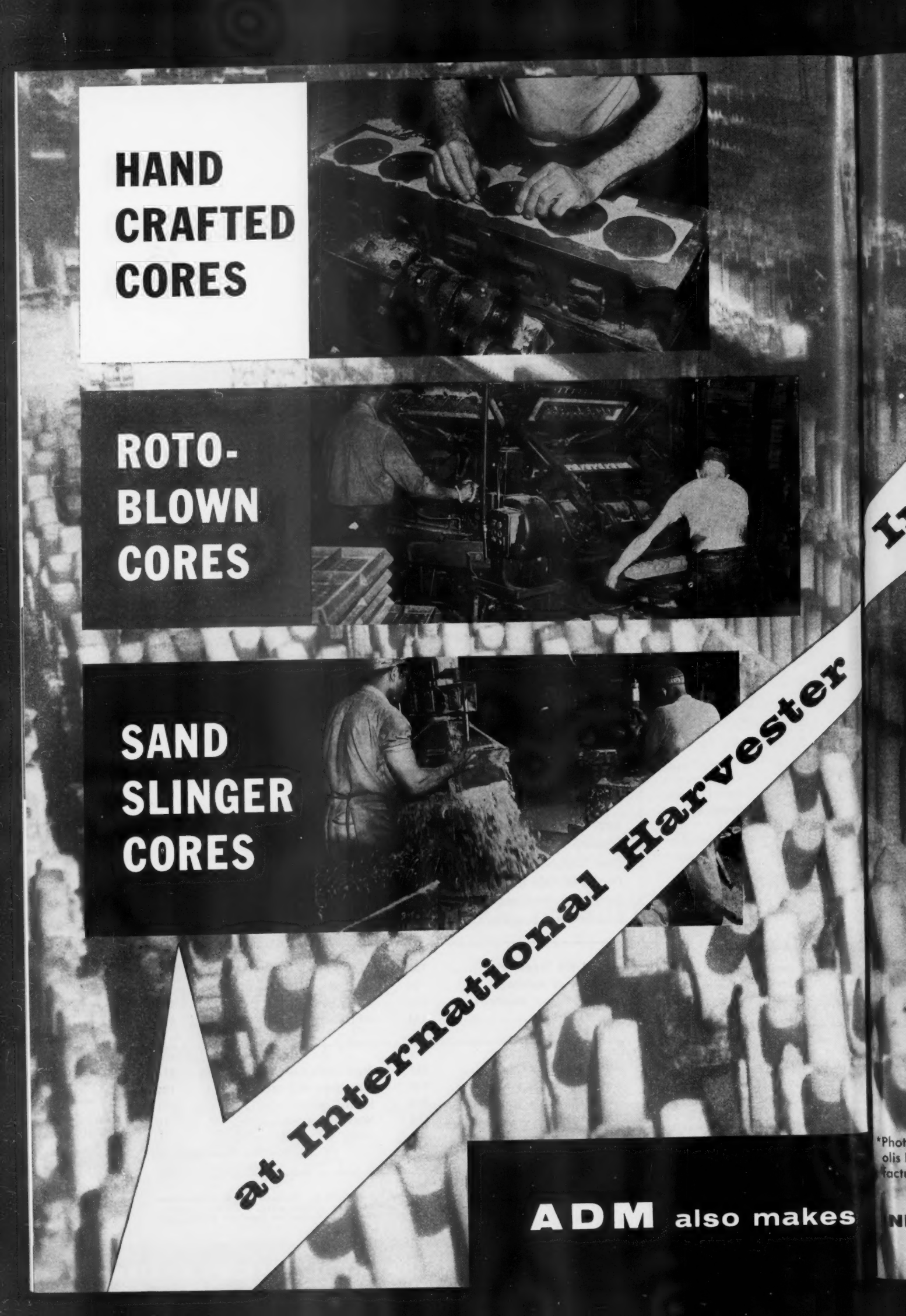
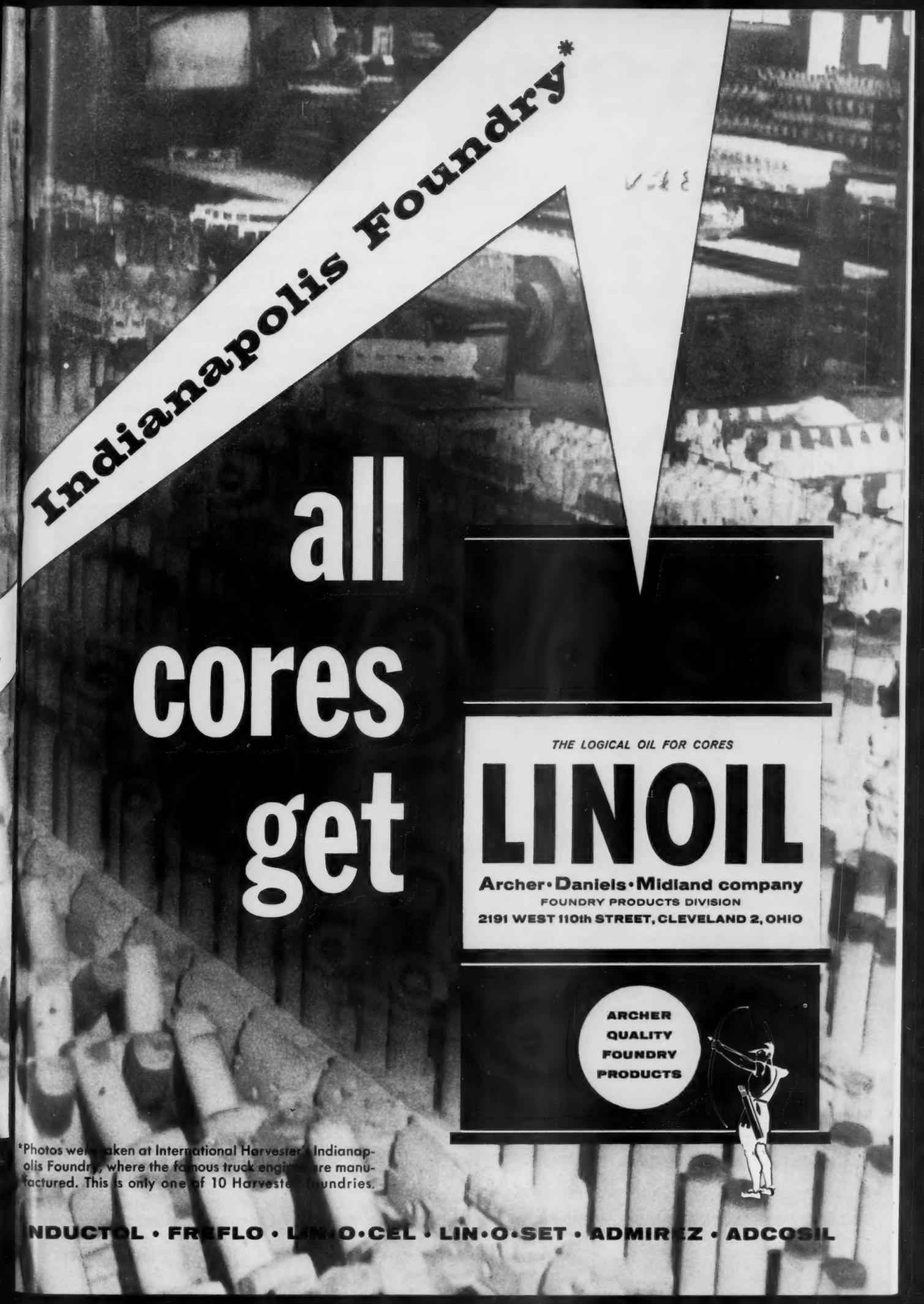

HAND CRAFTED CORES
ROTO-BLOWN CORES
SAND SLINGER CORES
at International Harvester
ADM also makes


Indianapolis Foundry*
all cores get
THE LOGICAL OIL FOR CORES
LINOIL
Archer•Daniels•Midland company
FOUNDRY PRODUCTS DIVISION
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ARCHER QUALITY FOUNDRY PRODUCTS
*Photos were taken at International Harvester's Indianapolis Foundry, where the famous truck engines are manufactured. This is only one of 10 Harvester foundries.
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# EASY ON THE DRAW

## ...every core comes clean!

The Air-Powered CP Core Box Vibrator really increases core output! Sledging is eliminated . . . core box maintenance is reduced . . . and there's no troweling. Simply clamp the vibrator to the inverted box, its 9000 orbital vibrations per minute assure a clean, perfect draw . . . no flaws, damaged edges, distorted sections or dimensional variations. The fast acting air clamp of the CP-219 grabs any cleat up to 6 inches – frees cores weighing up to 3000 pounds in less than 90 seconds! No special adaptors or fixtures are required. Write for details. *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, New York.*

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find out how you can bake your cores better, faster more economically ELECTRONICALLY! in

This Coleman CD-150 Dielectric Core Oven bakes over 8,000 pounds of urea-bonded pipe fittings cores per hour at Alabama Pipe Company, Anniston, Ala. Total time on conveyor is 11 minutes!

# COLEMAN Dielectric OVENS

**Which is better for you . . . dielectric or recirculating air core ovens?**

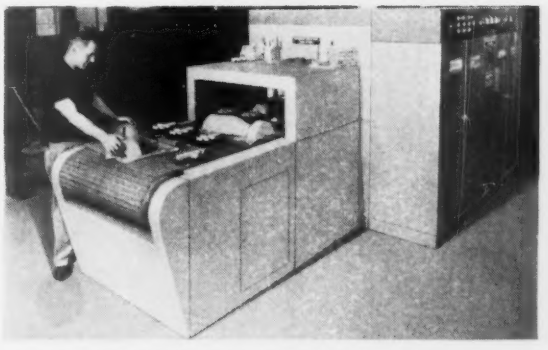
**As builders of the world's only complete line of foundry ovens, only Coleman Oven Engineers can give you practical, unbiased recommendations for your particular application.**

The foundries pictured are typical users of Coleman Dielectric Core Ovens. These ovens were installed after a thorough study by Coleman Oven Engineers indicated that dielectric core baking would be the most economical method in each case.

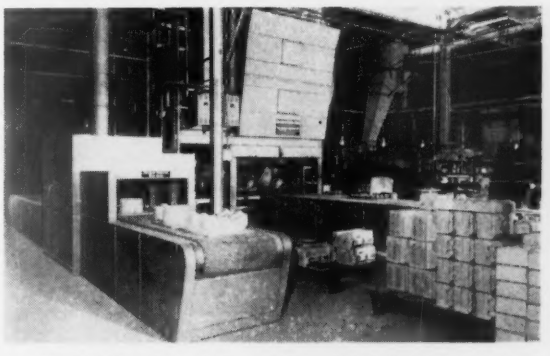
Because of this approach, based on over half a century of foundry "know how" combined with the latest electronic technology, every Coleman Dielectric Core Oven installation has been extremely profitable. Important savings have been made in time . . . in manpower . . . and through increased production.

Consult a Coleman Oven Engineer. There is no obligation. As builders of the world's only complete line of foundry ovens we have no reason to recommend anything but the best oven for your needs . . . We build them all.

WRITE FOR BULLETIN 54.



The Deming Co., Salem, Ohio, uses their Coleman CD-25 Dielectric Core Oven to bake a wide variety of phenol-bonded cores for cast iron and brass pump castings.



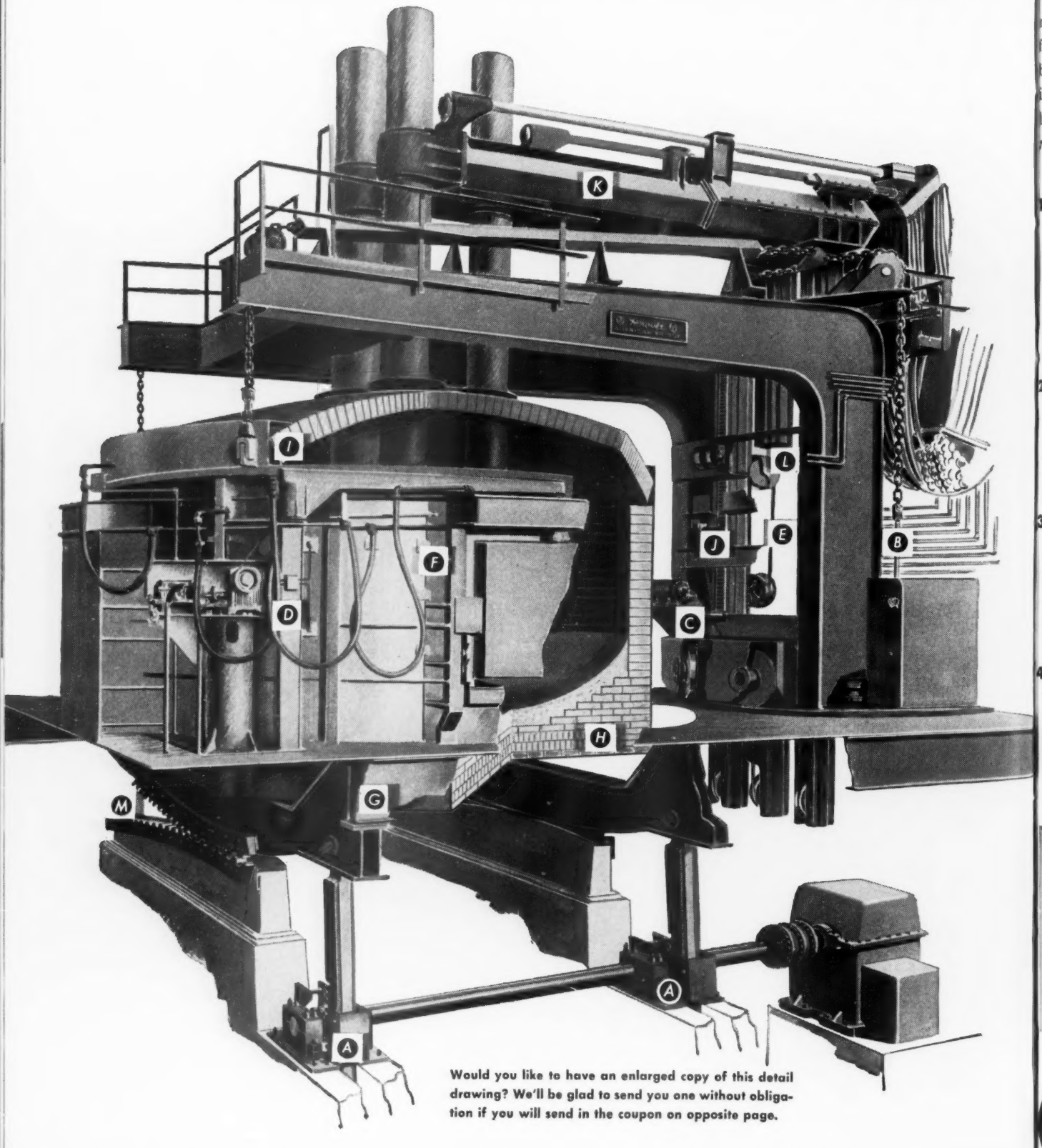
Hills-McCanna Company, Chicago, Ill. bakes 1500-1700 pounds of cores per hour for magnesium aircraft engine castings in their Coleman CD-25 Dielectric Core Oven.

**A COMPLETE RANGE OF TYPES AND SIZES . . .**
*for every core baking and mold drying requirement:*

Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers
Dielectric Core Ovens

**THE FOUNDRY EQUIPMENT COMPANY**
1821 COLUMBUS ROAD CLEVELAND 13, OHIO
***WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS***

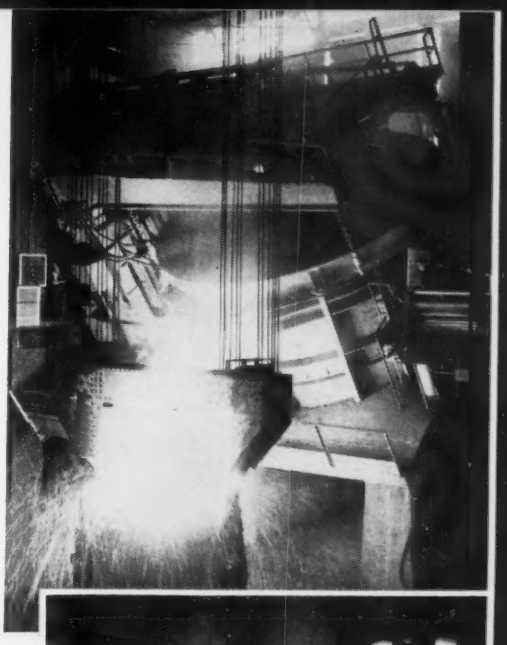
# Ten (10) reasons why
# is the finest electric furnace

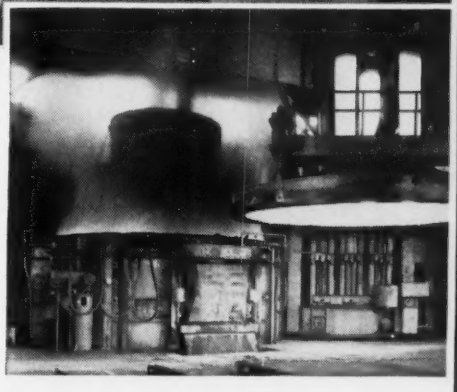



Would you like to have an enlarged copy of this detail drawing? We'll be glad to send you one without obligation if you will send in the coupon on opposite page.

***We welcome*** an opportunity to help you select and install the Heroult Furnace best suited to your requirements. Remember—*the Heroult we make and install for you will be the finest electric melting furnace that money can buy!*

# y the NEW Heroult e on the market!





To HELP YOU PRODUCE better quality steel faster and more economically, we have made important design improvements in the long-famous Heroult electric melting furnace. Five of the features shown in the cutaway drawing at the left and described below are to be found *only* in the new Heroult. *All ten* of the illustrated features are important to those interested in the most modern melting equipment. Any way you look at it—performance efficiency, operating economy, or low-cost maintenance—this *new* Heroult is unquestionably the *finest* electric melting furnace on the market.

**1. The Heroult Furnace is *the only 100% mechanically operated electric furnace.***

It includes such mechanical features as: (A) heavy rack-and-pinion-type tilting mechanism, (B) mechanical roof lift, (C) motor-driven, rotating, jib-type roof swing, (D) winch-operated, water-cooled, jib-type door-lifting mechanism, and (E) high-speed, electro-mechanical electrode-positioning mechanism.

**2. *Another exclusive* — Cage-type shell construction with shell plates loosely attached (F) to a heavy supporting structure.**

This construction minimizes shell warping and allows easy replacement of damaged shell plates.

**3. *Exclusive*—Operating mechanism independently supported.**

The tilting platform on which all operating mechanisms are supported is attached directly to the rockers independent of the shell structure (G). Thus operating mechanisms are unaffected by any shell distortion.

**4. *Exclusive*—Flat Bottom Shell.**

This feature (H) facilitates easy shell relining and provides maximum protection against burnouts. Thicker refractory at the sides of the hearth promotes more uniform bath temperature.

**5. *Exclusive* — Water-cooled, Skew Back Roof Ring.**

This feature (I) eliminates the need for special skew-shaped roof refractories.

**6. Electrode Mast Safety Device.**

This spring-loaded, rack-and-pawl-type device (J) provides positive protection against damage resulting from electrode winch cable breakage.

**7. Square-Section, Water-Cooled Electrode Mast Arms.**

This design (K) guarantees a rigid connection between mast and mast arm, thus helping to maintain proper electrode position.

**8. Remote-Controlled Electrode Clamps.**

This device, of the spring-clamp, air-release type, is located inside of the rear section of the water-cooled mast arm where heat cannot affect it.

**9. Square-Sectioned Electrode Mast.**

This design feature (L), developed by American Bridge, assures proper guiding and electrode positioning.

**10. Rockers.**

The heavy fabricated steel curved top and bottom rockers (M) minimize forward travel during tilting. These rockers are so designed that the furnace will tend to return to horizontal position from any degree of tilt.

*THE NEW*

**Heroult**

***ELECTRIC FURNACES***

***are available in:***

—sizes of shell diameter ranging from 7′ 0″ up, and with capacities of from 6,000 lbs. up to 400,000 lbs. and greater. They are equipped with roof-removing mechanism to permit fast top charging. They can readily be furnished with a non-magnetic shell bottom section to accommodate induction-stirring equipment.

Gantry-type top-charge furnaces, door-charge furnaces, and special furnaces for duplexing and non-ferrous melting can also be supplied.

**Heroult**

**ELECTRIC MELTING FURNACES**

**Send coupon for catalog and/or enlarged copy of detail drawing with special installation and engineering data.**

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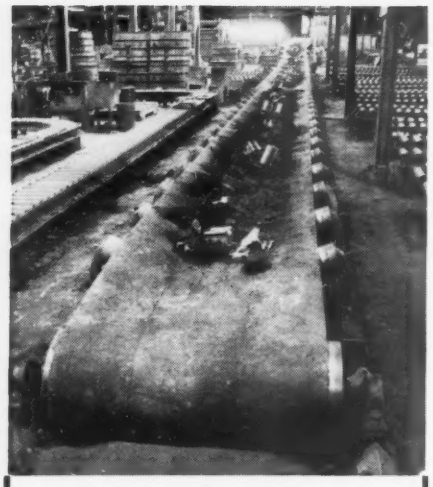
*Please send me a copy of the latest Heroult Electric Furnace catalog ( ) and/or your new folder showing large drawing with special installation and engineering data ( ).*

Name ..... Title.....

Firm Name .....

Address .....

City ..... State.....



**Imperial Belt gives 26 times expected life**

***Durability proven in destructive foundry service***

Operators of the Riverside Foundry counted on only a month's service from belting used on the new conveyor pictured above.

They figured the destructive action of heat (300°-600° F.) from carrying "cherry-red" castings and hot sand, plus abrasion and gouging, would ruin any belt quickly.

However, the original belt, Imperial Super Insulated Sahara Armored (205' x 42" x 6 ply) was still in operation after 26 months at the last report.

**Super-strong construction**

Such outstanding service records are not unusual for Imperial INNERLOCKED* Belting. The base fabric, heavy-duty hard silver duck, has a tensile strength of over 750 lbs. per inch of width. INNERLOCKED* stitches prevent ply separation.

Exclusive Imperial impregnating compounds waterproof, lubricate, toughen and preserve the duck fabric. Metallic reinforcement gives Sahara Armored Belting maximum resistance to abrasion and impact.

**Job-designed**

Imperial Sahara Belts are job-designed to withstand temperatures to 600° F. Whatever your needs, Imperial Belting will give you lowest long-time operating costs. Write for Data Sheet 54-2 which describes the Imperial Belts for foundry service.

*INNERLOCKED—*Reg. trade name of Imperial Belting Co.*

*You expect more from Imperial . . . and you get more!*

**Imperial BELTING CO.**

1755 S. Kilbourn Ave., Chicago 23, Ill.

*Circle 559 on Inquiry Card—Page 217*

# With the Editors

**A READER Comments:** FOUNDRY continues to study reader reactions to the advertising and editorial content. In addition to the reader performance surveys conducted by the Eastman Research Organization, New York, Ad-Gage studies are conducted. In the latter, copies are mailed to a number of readers and they are asked to indicate reaction to both advertising and editorial material by marking the issue and returning it to Cleveland. Now and then one of our readers also will take the time to return a letter with comments in connection with the Ad-Gage study. A very interesting one to us recently was received from T. B. Hickox, foundry superintendent, Aluminum Co. of America, New Kensington, Pa., who has been a reader of FOUNDRY for 19 years.

Some of Mr. Hickox's comments follow: "Just like we always turn to the sports page first in the daily paper, we do have a routine which we follow in going through FOUNDRY. We turn first to 'Late News.' Our second article is 'With the Editors' and this is a purely personal choice because we are friendly with Ed Bremer, Bob Herrmann, Virginia Harms and Virginia Taylor, all of whom we met years ago through the late Pat Dwyer. Thus we may learn about their whereabouts through that column. (We might add that when Pat Dwyer was amongst us, the first article we read was 'Adventures of Bill.')

"To guide us in our thinking of things to come, we read Ed Bremer's 'Foundry Developments.' Turning to 'Questions and Answers' we find that many people have problems like us, and they usually get the answer. To top off our routine reading, we go through 'Men of Industry' and 'Industry Briefs' to see who's who and where they will operate.

"In the July issue (the number being studied—Ed.) I especially liked Bill Gude's article 'Highly Mechanized Line Produces Enamelware Castings.' 'Foundry Teaching and Research at MIT' by Professor Taylor was very interesting and we called it to the attention of our Educational Department. We also liked Mr. Egbert's article on 'Die Casting Magnesium.'

"And last but not least, we could not miss the little cartoons, and we request that you keep them coming."

From all of the editors, our thanks Mr. Hickox, for telling us of the things you enjoy and find of value in FOUNDRY.

—o—

**All Outdoors:** During the past few years Bill Gude and I have made a number of talks in a variety of places. We have appeared in some of the best hotels, and some that were not so good. We have talked in University Clubs, Country Clubs, Engineers Clubs and in ivy covered halls at our institutions of higher learning. We have appeared at resort hotels and at such places as Doo Drop Inn, Poodle Dog Cafe and a Fish Grotto.

But Bill Gude really had an unusual experience in appearing at a meeting of the Cincinnati Management and Cost Group of the Gray Iron Founders' Society. The meeting was held, as shown below, in a woods owned by Peter E. Rentschler, president, Hamilton Foundry & Machine Co., Hamilton, O.

Bill reports just one difficulty. Just

*Sounder, cleaner metal...*

*Lower scrap loss...*

*Reduced labor...*

# with HARBISON-WALKER REFRACTORY GATE and RUNNER TILE

### CLEANER METAL

Harbison-Walker Gate and Runner Tile are strong and withstand rapid metal flow without excessive erosion. Cleaner metal is the result.

### LESS SCRAP LOSS

Tile of minimum diameters may be used, with considerable reduction of metal in gates, and consequent savings in scrap loss.

### REDUCED GAS INCLUSIONS

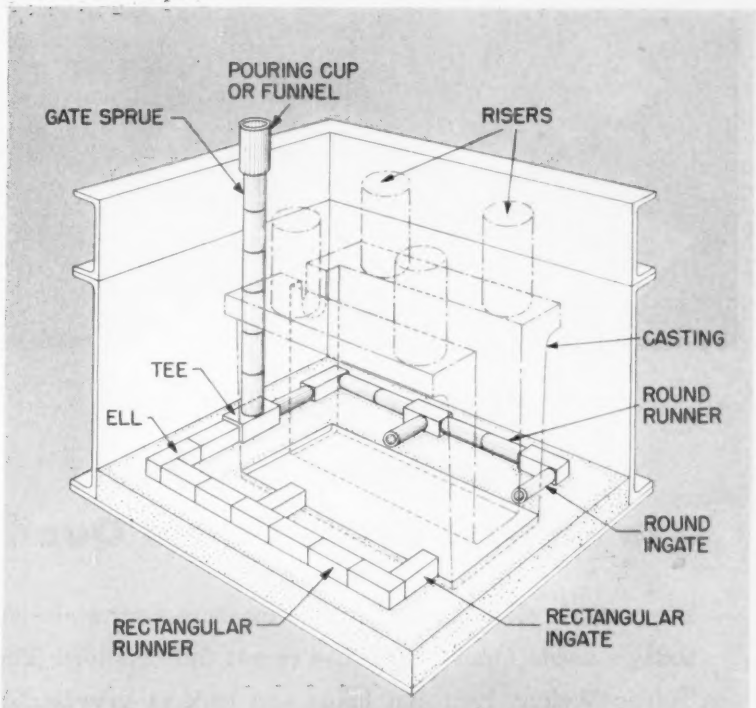
Refractory tile are much stronger than sand, permitting pouring under high pressure. This practice reduces gas inclusions.

### EASIER TO USE

Installation in the mold is easier and faster, and overall cost is less.

### TIGHT JOINTS ASSURED

The excellent workmanship of Harbison-Walker Gate and Runner Tile accounts for their good tight fit.




ALL SIZES AND SHAPES NEEDED
FOR COMPLETE GATING SYSTEMS

The drawing above shows a model arrangement illustrating how various shapes are used. The casting is shown in phantom.

Harbison-Walker tile are supplied in approximately 200 sizes and shapes. These include cups or funnels, round and square tile with plain or jointed ends, crosses, tees and ells. Many of the more popular sizes are available from stock.

Write for catalog of sizes from which to select those best adapted for your needs.

**HARBISON-WALKER REFRACTORIES CO.**
AND SUBSIDIARIES
*World's Most Complete Refractories Service*
*GENERAL OFFICES:* **PITTSBURGH 22, PENNSYLVANIA**


*Circle 560 on Inquiry Card—Page 217*

## Shows You the Job Your Scales are Doing to Control Costs, Guard Quality

It's scale check-up time! Time to measure your scales against today's needs—make sure they're not falling short. The new Toledo Weight Fact Kit helps you look at your scales as a *weighing system*—shows you if any scales are "misfits" in capacity, application or location. It will help you detect weighing inefficiencies that drain off profits.

Request your easy-to-use Weight Fact Kit today. It's free—no obligation! Take this opportunity to get the vital weighing information you need for efficient cost and quality control.

Eliminate errors in reading, remembering and recording weights—get fast, accurate, *printed* weight records with Toledo Printweigh in a full range of capacities for ticket, sheet or strip tape records.

**TOLEDO®**
**Headquarters for Scales**

**MAIL TODAY FOR FREE WEIGHT FACT KIT**

Toledo Scale Company
1408 Telegraph Road
Toledo 1, Ohio
Please mail to me a Toledo Weight Fact Kit without obligation.

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____


before he started the talk, a piece of earth moving equipment started in operation a short distance away and the competition was tough. But our boy won.

Refreshments, which included steaks, were served following the talk. Nice idea.

—o—

**A Time-Saver:** While our "Men of Industry" department presents many items dealing with the comings and goings of a large number of men in the foundry and allied industries, photographs are available for only a portion of the total. For example, the November issue presented 39 separate items mentioning 70 individuals, but we had available and reproduced only 24 photographs.

Thomas Kaveny Jr., president, Herman Pneumatic Machine Co., Pittsburgh, recently pointed out that it took some time to identify items and illustrations, although we do try to put the item and accompanying cut as near as possible together. Tom suggested a system of providing a different identifying mark for each item and its accompanying illustration. After studying this in the light of our mechanical problems, we came to the conclusion that it was too complicated for the present.

However, we are providing a compromise solution. In this issue you will find a dot in front of each item that has an accompanying cut. We hope this will help Tom and other readers save time in matching up news items and cuts. And, of course, we will continue to keep them as close together as possible.

—o—

**Deserved Award:** For outstanding service over a long period, Bob Wood, vice president, Minneapolis Electric Steel Castings Co., Minneapolis, on Nov. 8 was given the Silver Beaver award by the Viking Council of the Boy Scouts of America. Bob also was elected Council president.

Congratulations to a fine guy who does much for his industry and his community.

—o—

**Holiday:** While the election is over, the leaves have fallen, our mornings are frosty and we have had the first snow, it just does not seem possible that Christmas is so near.

But remembering that this is the last issue to reach you before the holiday, all of us on the staff of FOUNDRY hope that all of you will have a very merry Christmas.

F.G.S.

*Announcing Schumann's*
*Research and Refining*

**TRIUMPH**

**THE REVOLUTIONARY NEW SCHUMANN**

**C.P.* BRASS AND BRONZE INGOT BAR**

*KAUFMAN *C.P. (Controlled Process)*

## *Featuring a NEW HIGH IN QUALITY above and beyond the specifications*

Now, I. Schumann & Co. answers the growing demand for a quality brass and bronze ingot with none of the disadvantages of either the old fashioned "rough-top" ingot or the newer charcoaled "smooth-top" ingot. Made by refining methods that continue where older methods stop, and poured under rigidly controlled conditions to give a new high in quality to a new and different shape known as the C. P. Brass and Bronze Ingot Bar.

Schumann Brass and Bronze Ingot Bars will save trouble, time, and money for you in all phases of foundry operations. Write wire, or call us today for our new booklet, "ABOVE AND BEYOND THE SPECIFICATIONS" describing the new C.P. Ingot Bar and illustrating how to recognize quality.

*an exclusive process of*

**I. SCHUMANN & CO.**

*4391 Bradley Road • Cleveland 9, Ohio*

**Pal. App. For*

**"PRODUCED WITH THE FOUNDRYMAN IN MIND"**

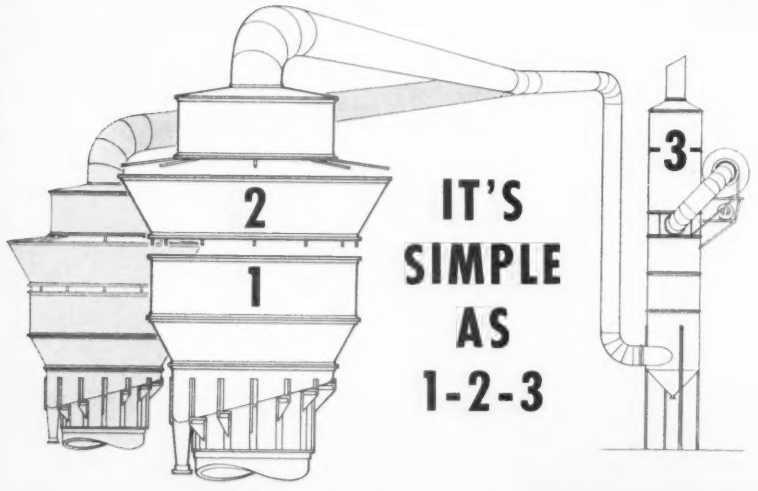


Circle 562 on Inquiry Card—Page 217

SCHNEIBLE

*new*

A SCHNEIBLE APPROACH MEETS YOUR CUPOLA EMISSION REQUIREMENTS *NOW* AND IN THE *FUTURE!*




IT'S SIMPLE AS 1-2-3

1. The highly successful "SW" Cupola Collector is guaranteed to remove down to .7 lbs. / 1,000 lbs. of gases.*
2. The recently designed adaptor can be added to an "SW" Collector, which will then be guaranteed to remove down to .5 lbs. / 1,000 lbs. of gases.*
3. Step No. 3 can be connected either to step No. 1 or step No. 2 by means of a takeoff connection to a Multi-Wash Collector. We would then guarantee to remove down to .3 lbs. / 1,000 lbs. of gases.*

*The guarantees listed above will be based upon individual installations and conventional cupola operations outlined in the AFS Cupola Handbook and in our brochure.

**IMPORTANT:** With the NEW SCHNEIBLE development to control cupola emissions, your original INVESTMENT is always utilized. As the codes you operate under become more stringent, you need only to go to the next step in the SCHNEIBLE PLAN.

SCHNEIBLE

WRITE TODAY FOR OUR NEW BROCHURE "CUPOLA EMISSION CONTROL— A NEW APPROACH"

CLAUDE B. SCHNEIBLE COMPANY

P. O. Box 81, North End Station—Detroit 2, Michigan

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

SERVING FOUNDRYMEN THE WORLD OVER

# CALENDAR of Meetings

**Dec. 3-5—Air Pollution Control Association,** semiannual meeting, Rice Hotel, Houston, Tex.

**Dec. 5-7—American Institute of Mining and Metallurgical Engineers,** electric furnace steel conference, Morrison Hotel, Chicago.

1957

**Jan. 18—Malleable Founders' Society** semiannual meeting, Hotel Cleveland, Cleveland.

**Jan. 28-31—Plant Maintenance and Engineering Show,** Public Auditorium, Cleveland.

**Feb. 4-8—American Society for Testing Materials, committee week and spring meeting,** Benjamin Franklin Hotel, Philadelphia.

**Feb. 7-8—Malleable Founders' Society,** 2nd technical and operating conference, Wade Park Manor, Cleveland.

**Feb. 14-15—Wisconsin Regional Foundry Conference,** Hotel Schroeder, Milwaukee.

**Feb. 21-22—Southeastern Regional Conference,** sponsored by Birmingham and Tennessee chapters, AFS, Dinkler-Tutwiler Hotel, Birmingham.

**Feb. 25-Mar. 1—International Heating & Air-Conditioning Exposition,** International Amphitheatre, Chicago.

**Mar. 13-14—Foundry Educational Foundation,** college-industry conference, Hotel Cleveland, Cleveland.

**Mar. 15-16—California Regional Conference,** Claremont Hotel, Berkeley.

**Mar. 18-19—Steel Founders' Society of America,** annual meeting, Drake Hotel, Chicago.

**Mar. 25-29—American Society for Metals,** Western Metals Congress and Exposition, Ambassador Hotel and Pan-Pacific Auditorium, Los Angeles.

**Apr. 10-11—Malleable Founders' Society,** market development conference, Edgewater Beach Hotel, Chicago.

**Apr. 12-13—East Coast Regional Conference,** sponsored by Metropolitan, Chesapeake and Philadelphia chapters, AFS, Benjamin Franklin Hotel, Philadelphia.

**May 6-10—American Foundrymen's Society,** 61st annual convention and castings exhibit, Cincinnati.

**May 20-24—Design Engineering Show,** Coliseum, New York City.

**June 13-14—Malleable Founders' Society,** annual meeting, Broadmoor, Colorado Springs, Colo.

**June 16-21—American Society for Testing Materials,** annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

**June 20-21—American Foundrymen's Society,** 2nd annual foundry instructors' seminar, Kellogg Center, Michigan State University, East Lansing, Mich.

**June 23-25—Alloy Casting Institute,** annual meeting, Homestead, Hot Springs, Va.

**June 27-28—Refractories Institute,** annual meeting, Greenbrier, White Sulphur Springs, W. Va.

**June 20-22—Penn State Foundry Conference,** sponsored by Pennsylvania State University in co-operation with AFS chapters in New York and Pennsylvania and several independent foundry groups. Pennsylvania State University, University Park, Pa.

**Sept. 17-20—American Die Casting Institute,** annual meeting, Edgewater Beach Hotel, Chicago.

**Sept. 23-24—Steel Founders' Society of America,** fall meeting, Homestead, Hot Springs, Va.

**Sept. 26-28—Missouri Valley Regional Conference,** sponsored by St. Louis, Tri-State, and Mo-Kan chapters, AFS, and Missouri School of Mines Student Chapter, Missouri School of Mines and Metallurgy, Rolla, Mo.

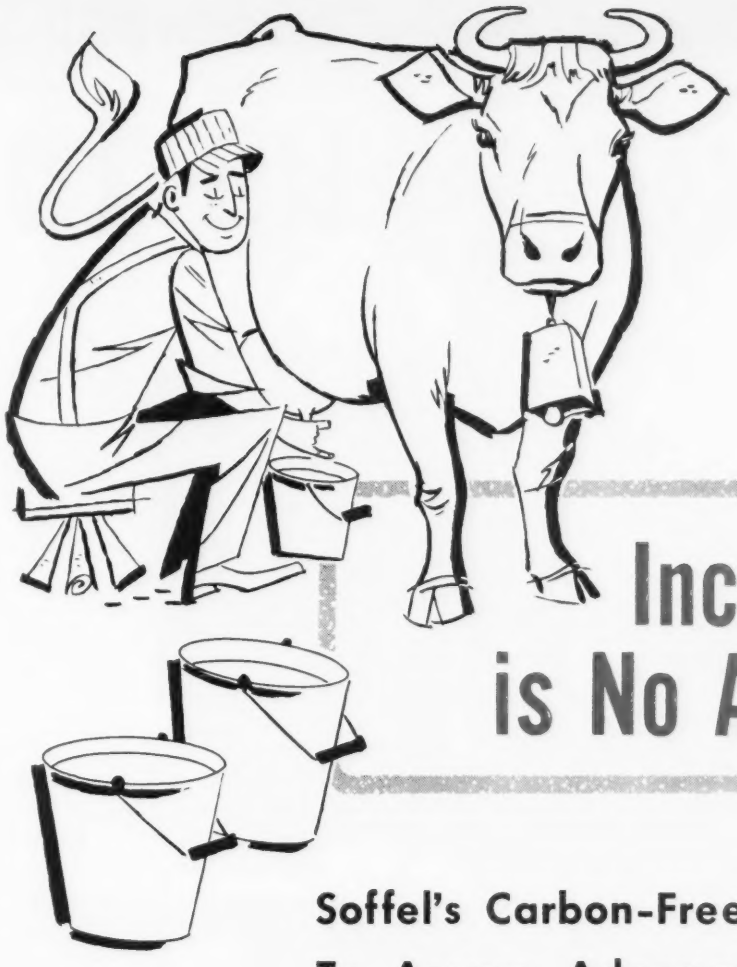
**Oct. 9-11—Gray Iron Founders' Society,** annual meeting, Drake Hotel, Chicago.

**Oct. 12-17—Conveyor Equipment Manufacturer's Association,** annual meeting, Grand Hotel, Point Clear, Ala.

**Oct. 17-19—Foundry Equipment Manufacturer's Association,** annual meeting, Greenbrier, White Sulphur Springs, W. Va.

**Nov. 2-8—American Society for Metals,** national metals exposition and congress, International Amphitheater, Chicago.

**Nov. 11-13—Steel Founders' Society of America,** technical and operating conference, Hotel Carter, Cleveland.



# Increased Yield is No Accident!

## Soffel's Carbon-Free Liquidizer Is TOPS . . . To Assure Adequate "FEEDING" Metal When It Is Needed!

SOFFEL'S Exothermic Carbon Free Liquidizers for Iron, Steel, Nodular Iron and Non-ferrous Alloys are scientifically designed to enable you to drastically reduce the size of your feeding heads on any type casting. It is a patented exothermic compound free of carbon or any other element which could contaminate any type of alloy.

By the use of Soffel's Carbon Free Liquidizers, you can obtain more sound, shrink-free castings than ever before from each ladle of metal poured. We welcome the opportunity to have a Soffel Sales Engineer prove to you why Soffel's Carbon Free Liquidizers are really TOPS for increasing yields and solving troublesome feeding problems.

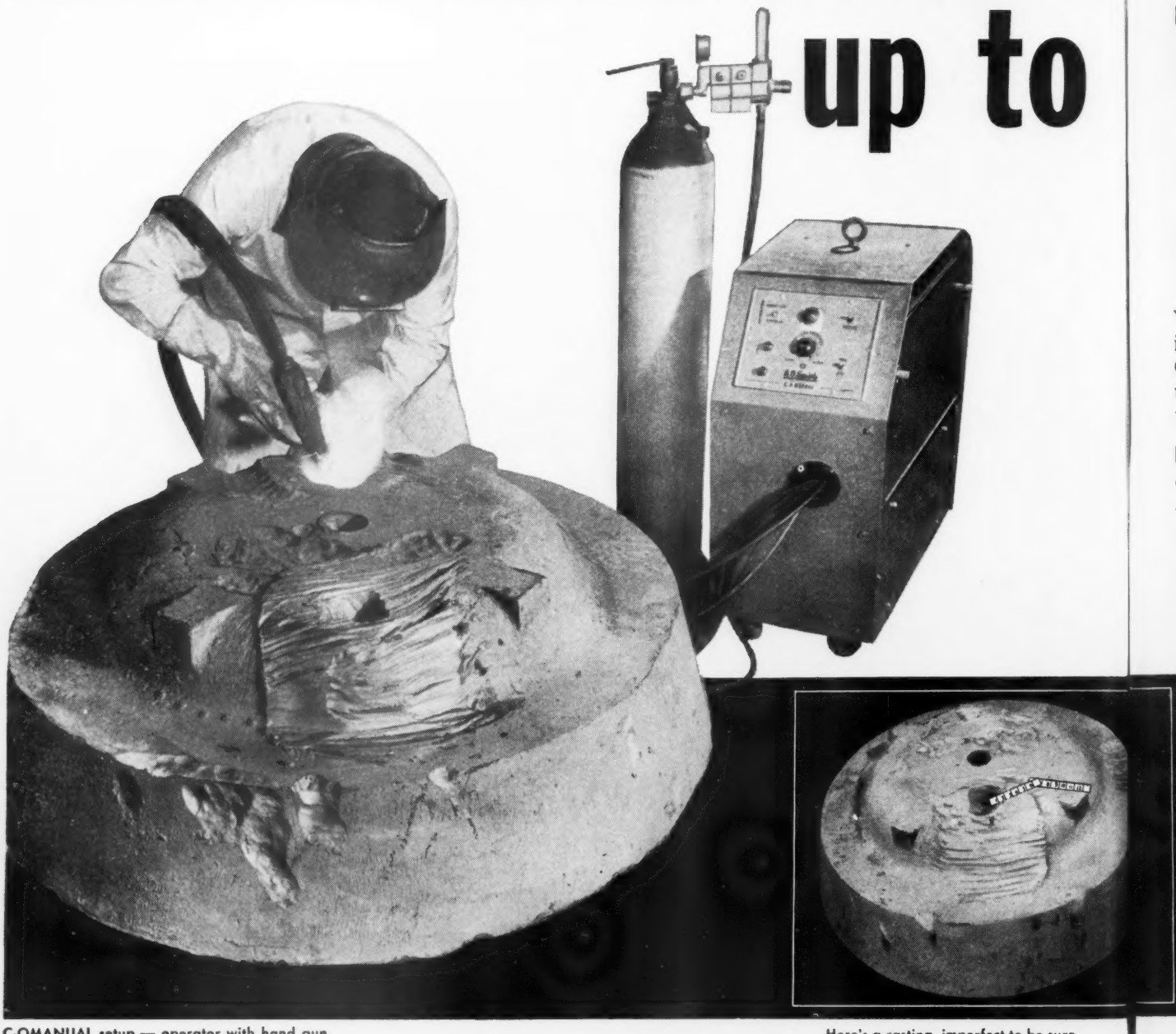
**PITTSBURGH METALS PURIFYING CO., Inc.**
1352 Marvista St., N. S. Pittsburgh 12, Pa.

"WORLD'S LARGEST MANUFACTURER OF FLUXES, PURIFIERS AND EXOTHERMIC COMPOUNDS FOR ALL METALS AND ALLOYS"


Circle 564 on Inquiry Card—Page 217

# *Midwestern foundry salvages castings...*

# up to



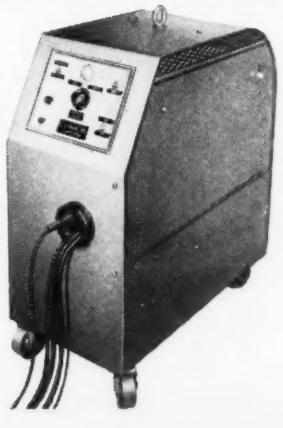
C-OMANUAL setup — operator with hand gun, portable remote control console and A. O. Smith 600 amp d-c rectifier not visible in illustration.

Here's a casting, imperfect to be sure, but economically salvageable thanks to low-cost, high-speed C-OMANUAL.

## C-OMANUAL IS A REVOLUTIONARY NEW CARBON

Introduced in early 1956, C-OMANUAL has already proven exceptionally efficient for a wide variety of welding jobs. It's fast, inexpensive and it makes the welder's job easy, practically fatigueless. And, with an exclusive two-speed head, the operator can switch to the proper feed for either light or heavy wire at a flick of a selector knob.

**NEW FEATHER-WEIGHT HAND GUN** . . . is as easy to use as pointing your finger. Water-cooled, it has no "O" rings . . . eliminates leakage. Ends need for complicated switchovers when changing wire sizes. All connections are fully protected.



## *puts down metal at rates...*

# ½ lb. per minute!

## *with A. O. Smith* C-OMANUAL

When it comes to building up blowholes and other imperfections in castings, foundries are "sold" on C-OMANUAL. They're putting down metal at rates up to 30 lbs. an hour where with previous methods they put down three to five lbs. per hour.

**Fast, easy, accurate** — With C-OMANUAL, the operator works with a light-weight, perfectly balanced hand gun. He has the advantages of visible arc welding — spotting the nozzle's a cinch. And there's no flux to clean, no chipping, no scraping necessary. You can start at the bottom and work right to the top—without stopping. The C-OMANUAL control console automatically adjusts arc length too . . . compensates for distance variations.

**Uses lowest cost gas** — With C-OMANUAL, the carbon dioxide for shielding the arc costs only one cent per cubic foot and uses approximately 30 cubic feet per hour.

**Seeing is believing** — For complete details on how C-OMANUAL is helping foundries get an entirely new concept of low cost and high speed in casting salvage — contact your "man from A. O. Smith." He'll be happy to arrange for a demonstration, let you judge for yourself why C-OMANUAL is one of the "hottest" new advances in welding history!

Closeup of typical crater to be filled — diameter approximately 7 inches . . . depth 4 inches.

Rebuilt casting before grinding. Note absence of slag. Deep penetration and weld quality are assured.

Completed casting. On jobs such as this, C-OMANUAL puts down weld metal at least 5 times faster than conventional electrodes.

## DIOXIDE HAND GUN WELDING PROCESS

**COMPACT, EASILY PORTABLE CONTROL CONSOLE** is mounted on free-rolling rubber casters. Contains wire reel, feed and speed controls, easily traced electrical circuits and all gas and water connections. Controls on front panel are conveniently grouped, easy to read.

**RELIABLE, EFFICIENT POWER SOURCE** is provided by a special A. O. Smith 600 amp d-c rectifier. Unit has no moving parts to wear and cause trouble . . . is compact and easily moved from spot to spot around the shop.

*Through research* A.O. Smith *. . . a better way*

**A.O.Smith**

CORPORATION

WELDING PRODUCTS DIVISION

MILWAUKEE 1, WISCONSIN

International Division: Milwaukee 1, Wisconsin



Circle 565 on Inquiry Card—Page 217

# LET'S LOOK at

**OVENS** for every baking requirement

**OVENS** that will be faster and less expensive to operate

**OVENS** that are designed to best fit your operation

Carl Mayer designs and manufactures all types of ovens as well as "specials" to meet unusual operating conditions. Most incorporate the Carl Mayer recirculating heating system with sealed combustion chamber that keeps gases from prematurely escaping into the load area. Cores and molds are baked evenly with no burning. Temperatures are always under control.

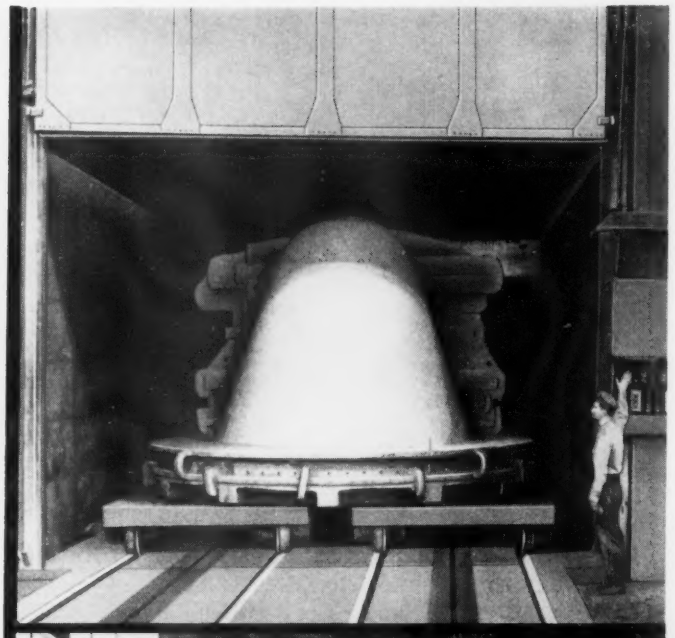
***Write for Bulletin 53-CM***

*TOP RIGHT—This large car type mold oven is installed at Pittsburgh Steel Foundry. Its special triple slotted panel construction reduces heat loss 1/3. Fuel savings up to 50% over old conventional methods are possible. Drying time is often cut in half and temperatures are uniformly controlled.*

*MIDDLE RIGHT—This rack type core baking oven is at the Fremont Foundry Co., Fremont, Ohio. It is equipped with a recirculating combination gas-oil fired heating system.*

*BOTTOM RIGHT—Vertical Core Oven (unloading position) at A. C. Williams Company, Ravenna, Ohio. This oven is 11'-0" wide x 11'-0" deep x 45'-0" high.*

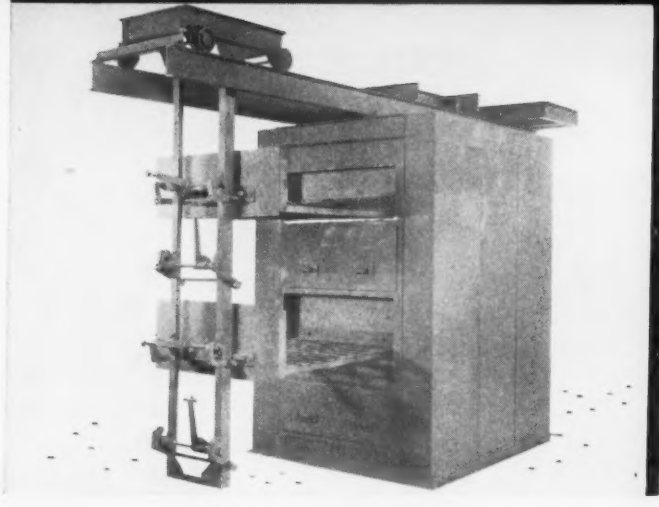
*BELOW—Our standard rolling drawer type core baking oven. The heating equipment (not shown) may be mounted on floor beside unit or on the roof. Particularly adaptable to brass and aluminum foundries.*

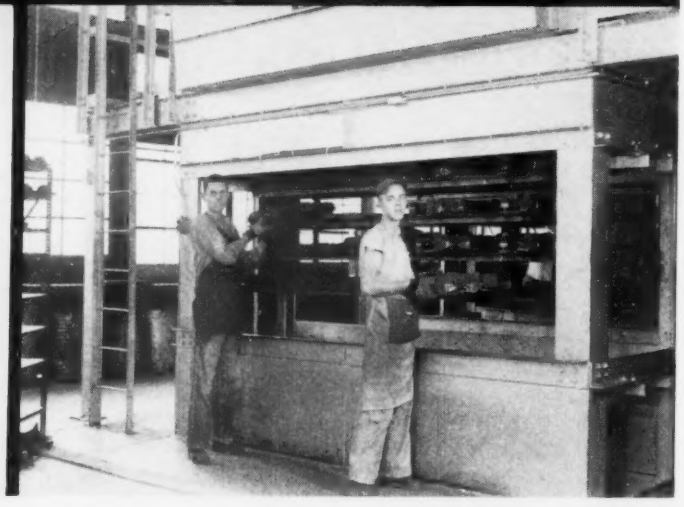


THE **carl mayer** CORP.

3030 EUCLID AVENUE CLEVELAND 15, OHIO

OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories





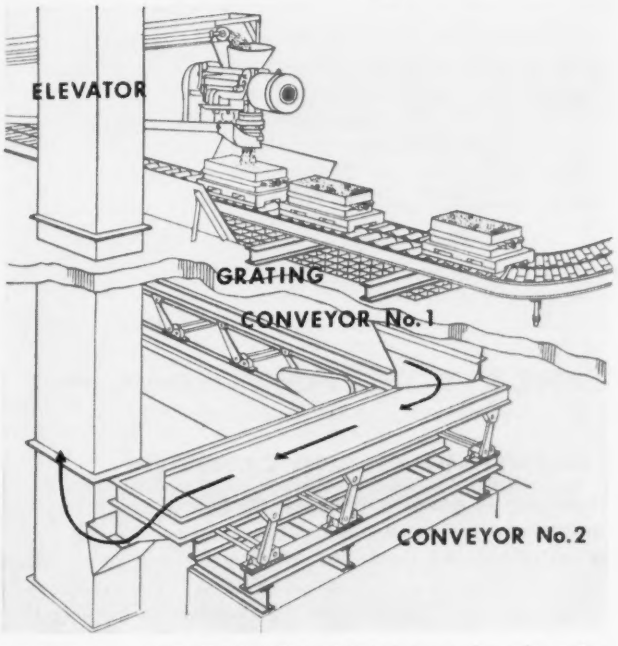


Circle 566 on Inquiry Card—Page 217

**PREPARED SAND RECIRCULATING SYSTEM** installed at a Milwaukee foundry. Arrangement of Link-Belt oscillating conveyors promotes a clean foundry—eliminates congestion on molding floor.

## LINK-BELT oscillating conveyors provide clean molding area with

# underground sand handling




**SPILL FROM SAND SLINGER** drops through grating to Link-Belt oscillating conveyors. Sand is conveyed to Link-Belt Bucket elevator for transfer to sand preparation system.

Whether handling spill sand—as at Pelton—or hot, abrasive sand and castings from shakeout, Link-Belt "PA" oscillating conveyors utilize a gentle but positive action, assuring uniform flow, regardless of load surges. Their compactness offers unmatched layout flexibility. One-piece metal trough with no return run and few moving parts assure minimum operating and maintenance expense . . . keep handling costs down.

For facts on Link-Belt sand handling and preparation equipment, call your nearby Link-Belt office or write for Book 2423. For full data on Positive Action oscillating conveyors—sold from stock in 8-in. to 36-in. widths—get Book 2444. 14,297

**LINK-BELT**

**CONVEYORS AND PREPARATION MACHINERY**

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

# INJUN GAME NOT TOO TAME

**(Junior's control helps make a goal!)**

PRINCESS WENATCHEE:
*"Another goal for Junior! Control help him win."*

CHIEF KEOKUK:
*"Control? He trip me up."*

CHIEF KEOKUK JR.
*"Injun Lacrosse, like any game — not too tame!"*

Control can net a profitable return in Lacrosse . . . and in processing iron and steel! Foundries and steel plants everywhere control costs and quality with Keokuk Silvery Pig Iron . . . the superior form of silicon introduction. Pig for pig, car for car, its uniformity never varies. Handle it by magnet . . . charge it by weight (or count the piglets for equal accuracy). Leading aluminum producers specify Keokuk Silicon Metal for uniform high purity. When you think of silicon, think of Keokuk!

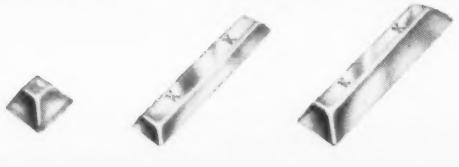
**KEOKUK ELECTRO-METALS COMPANY** KEOKUK, IOWA

Wenatchee Division, Wenatchee, Washington

**SALES AGENT: MILLER AND COMPANY**

332 S. Michigan Avenue, Chicago 4, Illinois
3504 Carew Tower, Cincinnati 2, Ohio
8230 Forsyth Blvd., St. Louis 24, Missouri

Keokuk Silvery Pig Iron is available in 60 and 30 pound pigs and 12½ pound piglets ... in regular analysis or alloyed with other elements to match your requirements.



# B.F.Goodrich

# 3000-degrees hot but doors don't melt

***A typical example of B. F. Goodrich improvement in rubber***

THERE'S melted steel inside those big furnaces. Temperature is 3000 degrees. The heavy steel doors would melt in minutes except for that hose that carries a stream of cooling water in and out of them.

But hose was burning out in months or even weeks. It had to stand heat 24 hours a day, seven days a week, was often banged by big "charging machines," spattered with hot metal. Then B. F. Goodrich developed a new kind of hose made of wire, asbestos and rubber. It had been in use more than a year when the above picture was taken. It is less expensive than the hose used before, is much lighter and more flexible, easier for workmen to handle. One man can install it where two men were needed for other hose.

B. F. Goodrich has made hundreds of improvements in dozens of kinds of hose to make them last longer, cost less, save your time and money. Most improvements, while making the hose stand more abuse, have also made it more flexible and easier to handle. B. F. Goodrich makes hose to carry almost anything—air hose that stands sharp flying rocks outside and hot oil inside, burstproof steam hose that can't burst even if it wears out, hose that lasts for years carrying gasoline, paints, chemicals, even dry materials such as flour or cement.

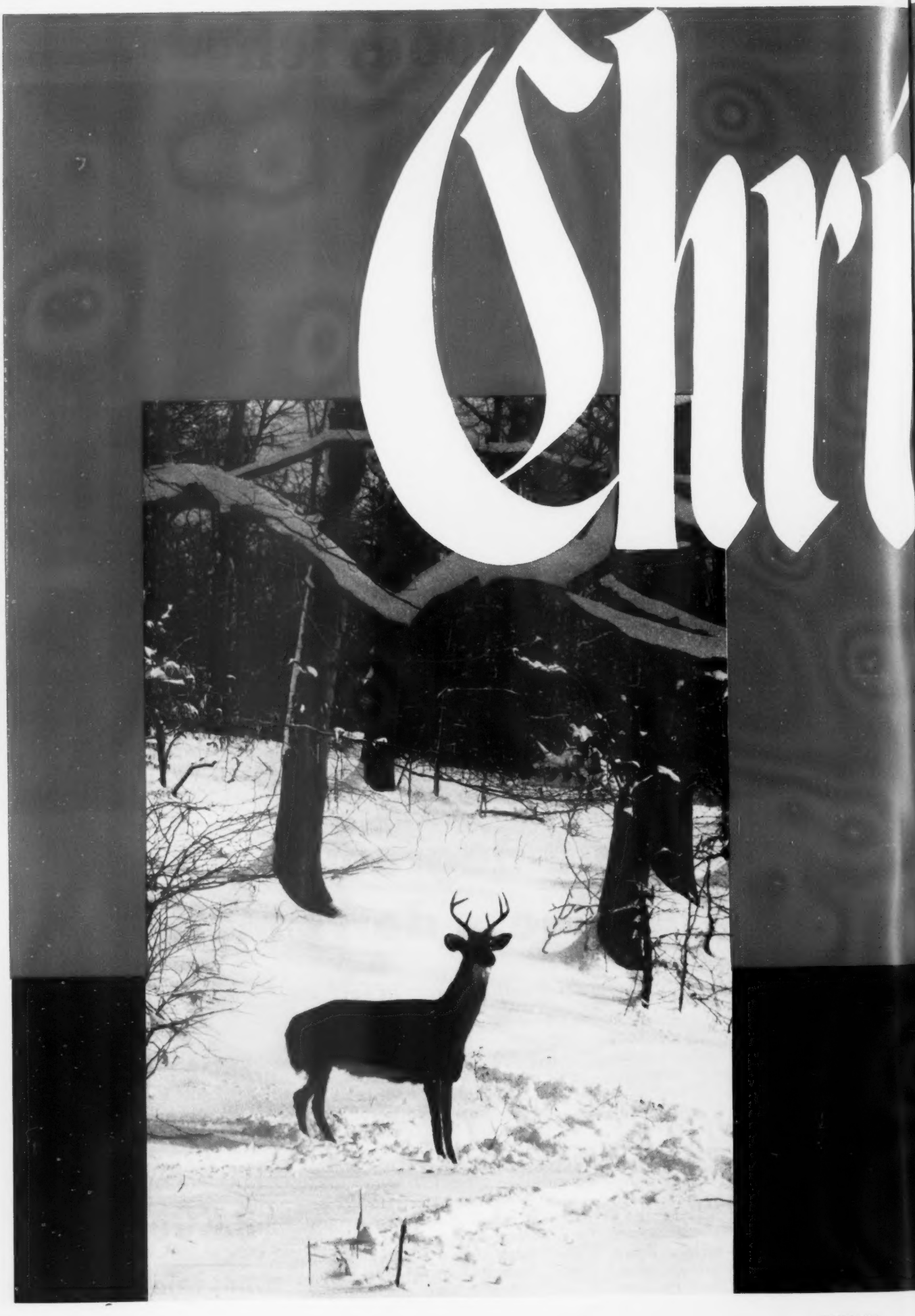
Call your B. F. Goodrich distributor for more information about any kind of hose, belting or other rubber products. *B. F. Goodrich Industrial Products Company, Department M-796, Akron 18, Ohio.*

**B.F.Goodrich**

**INDUSTRIAL PRODUCTS**



Circle 569 on Inquiry Card—Page 217

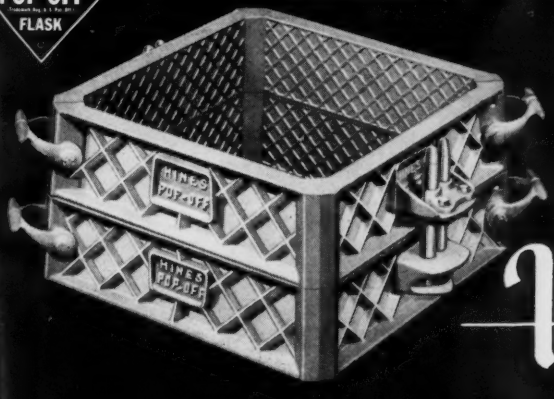

Chri

# stmas

Stand fast therefore in the liberty
wherewith Christ hath made us free,
and be not entangled again with the
yoke of bondage.

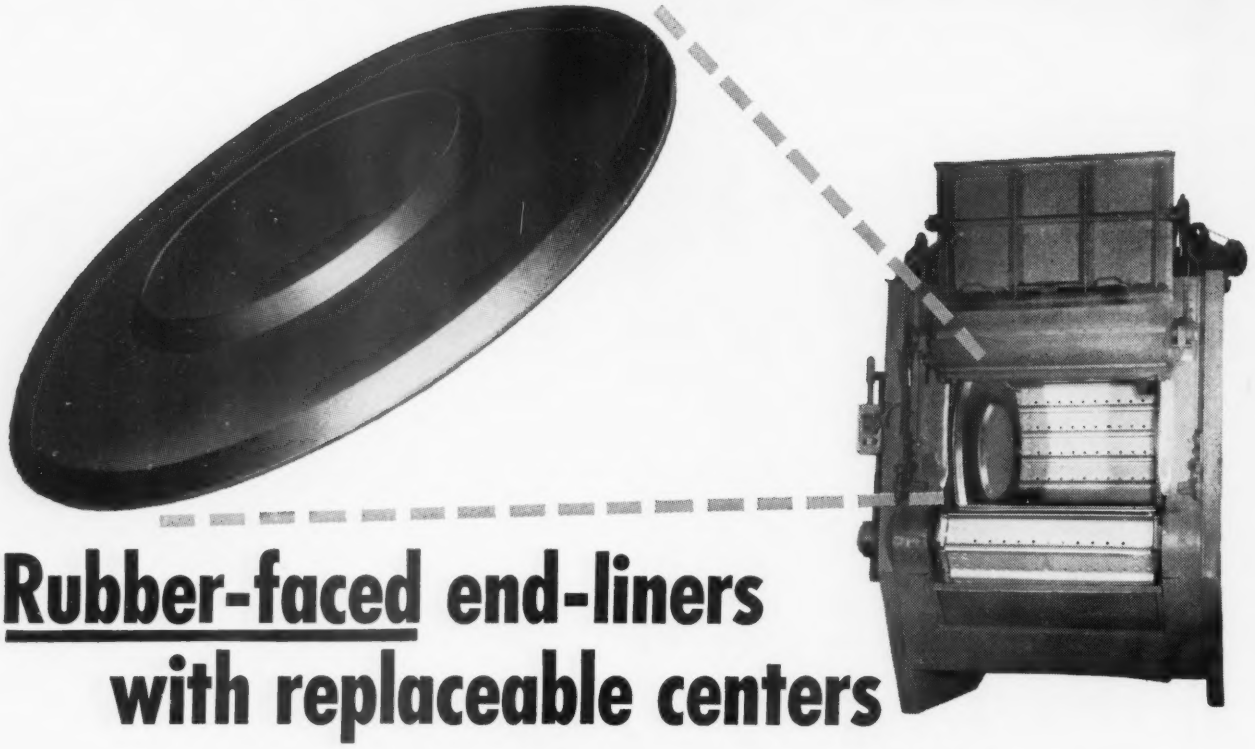
—New Testament: Galatians, v, 1.

HINES POP-OFF FLASK




## Hines Flasks

THE HINES FLASK CO., 3431 WEST 140TH STREET, CLEVELAND 11, OHIO



# Rubber-faced end-liners with replaceable centers

## ...cut shot breakage up to 50%

## ...greatly increase end-liner life

**With Gates rubber-faced shot blast discs you make BIG savings two ways:**

1. **You save on shot because the rubber disc cuts shot breakage.**
2. **You save time and cost in making end-liner replacements.**

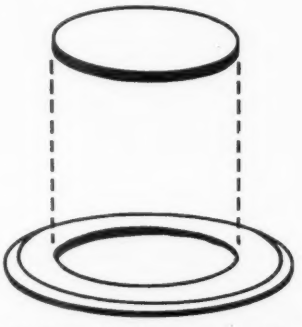
***Here's why:***

Heaviest wear on end-liners in shot blast and tumble blast machines comes in the center area. With either of Gates two types of disc (center patch, or hollow center), you replace only the center area as needed. Two or three center discs can be used before the main disc is finally worn through.

This important engineering development has increased end-liner service life up to FOUR TIMES.

And rubber protection of end-liners reduces shot breakage as much as 50% — giving you substantial savings on shot replacement costs.

For complete size and cost data, contact any of the Gates Authorized Contractors listed below, or write direct to The Gates Rubber Company Sales Division, Inc., Denver, Colorado.



**Hollow Center Disc with Patch Plate**

Center disc is recessed flush in hollow center of main disc. Center can be replaced without replacing entire end-liner.

**Solid Disc with Center Patch**

Both discs easily bolted to main structure of shot blast machine.

TPA 103B

**J. H. Nelson**
8200 Vincennes St., Chicago, Ill.

**Rubber Faced Steel Plate, Inc.**
28400 Grand River, Farmington, Mich.

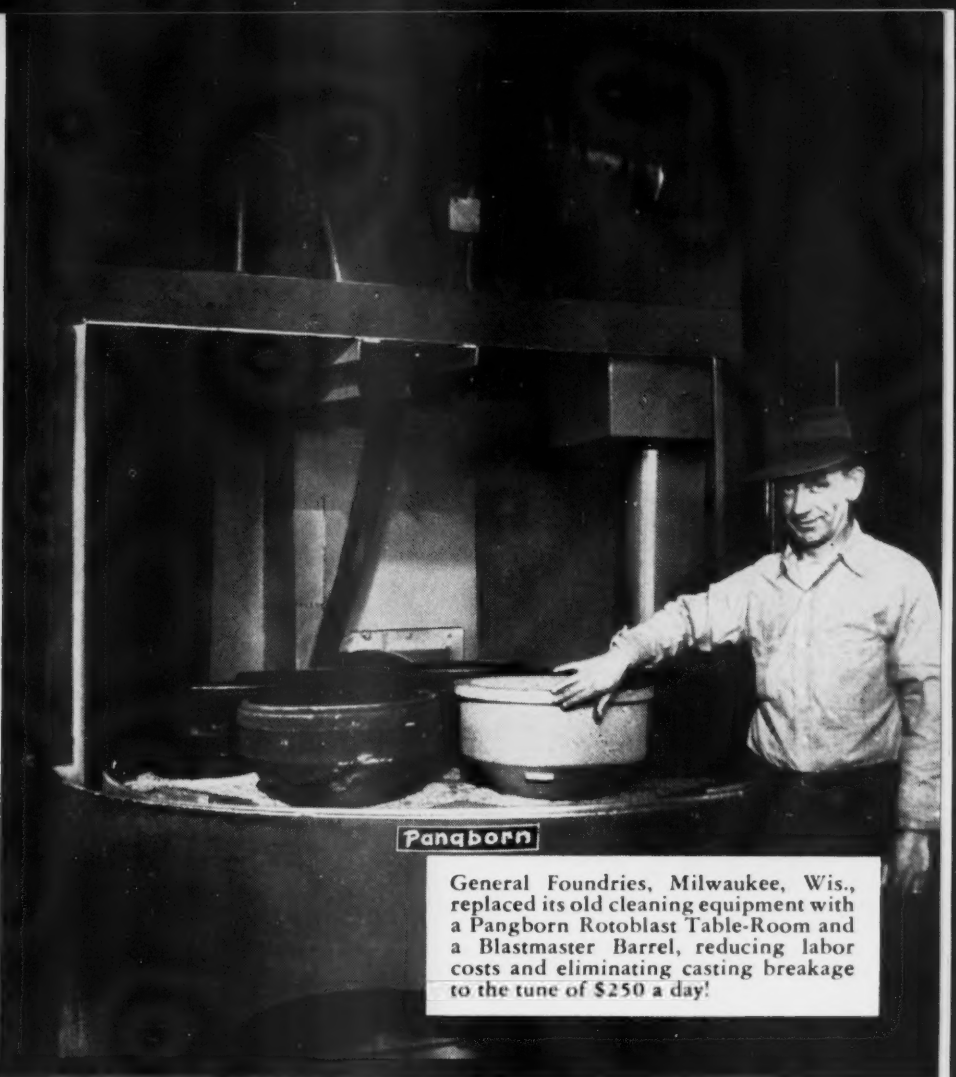
**Baker Warren**
80-26th St., Pittsburgh, Pa.

**Wiley Hughes Supply Co.**
New York Ave. & Spruce St., Trenton, N. J.

**Owen-Richards Co., Inc.**
824-31st St. No., Birmingham, Ala.

**Western Rubber Products Co.**
320 So. Grand Ave., St. Louis, Mo.

# Pangborn Rotoblast® Cuts Cleaning Costs $250 a Day for General Foundries!




General Foundries, Milwaukee, Wis., replaced its old cleaning equipment with a Pangborn Rotoblast Table-Room and a Blastmaster Barrel, reducing labor costs and eliminating casting breakage to the tune of $250 a day!

Some foundrymen tell us they're most impressed with Pangborn Rotoblast's speed of cleaning, its high production rate. Others praise the quality of its work . . . the manpower reduction due to its automatic operation. But whatever the reasons—cleaning quality, speed, lower labor and maintenance costs, no abrasive loss—they all add up to the fact that Pangborn Rotoblast gives you *lower cost per ton of castings cleaned.* And, in the final analysis, this figure determines the efficiency of your blast cleaning operation.

Investigate Pangborn Rotoblast and discover which machine can best streamline your operating costs! Write for Bulletin 227 to PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Maryland. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

## And $1,500 a month for Specialty Aluminum and Bronze!

At Specialty Aluminum and Bronze Corp., Revere, Mass., the Pangborn Blastmaster Barrel reveals any casting imperfection as soon as blasted. This saves further processing costs. This and other savings total $1,500 a month for the firm!

# Pangborn

## BLAST CLEANS CHEAPER

Rotoblast Blastmaster® & Continuous-Flo Barrel

Rotoblast® Tables & Table-Rooms

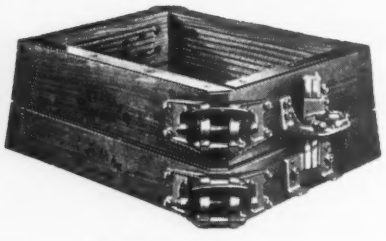
Special Blast Rooms & Cabinets

Pangborn Dust Control Equipment

*Distributors for Malleabrasive and Tru-Steel Abrasives*

*Circle 572 on Inquiry Card—Page 217*

# LARGE OR SMALL



Patent No. 2393200
Other Patents Pending

ADAMS CHERRY
EASY-OFF FLASK

**PIN AND EAR ARRANGEMENT SUPPLIED TO SUIT YOUR PRESENT PATTERN PLATE GUIDES**

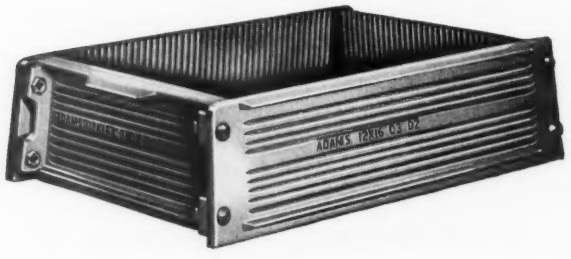
**Write us today for our circulars on Cherry Easy-Off Flasks and Cast Iron or Aluminum Jackets.**

# ADAMS CHERRY EASY-OFF FLASKS

## with ADAMS JACKETS

### CAST IRON OR ALUMINUM

To Complete
a winning combination

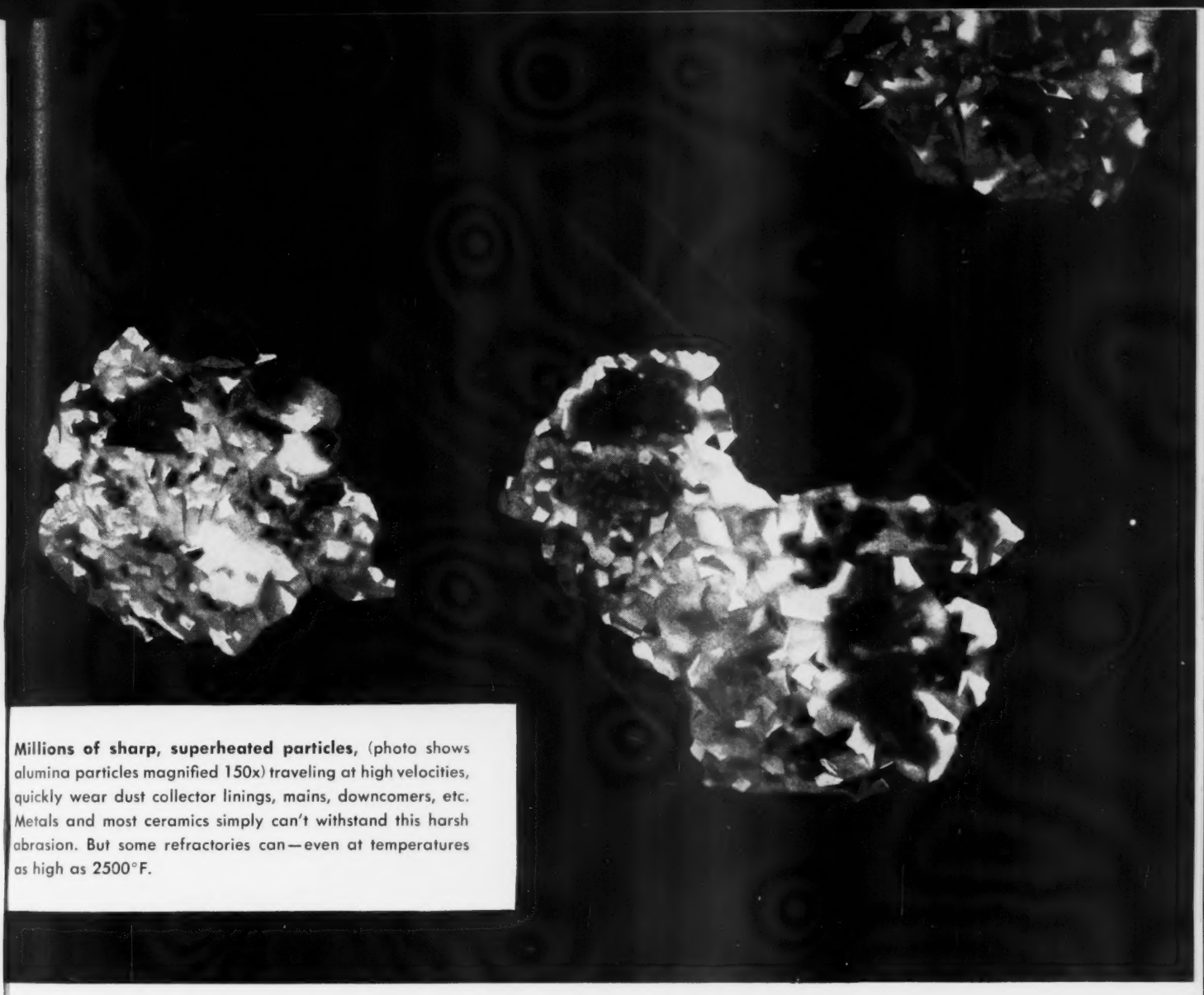


# The ADAMS Company

ESTABLISHED 1883

**700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.**

**MOLDING MACHINES and FLASK EQUIPMENT**



**Millions of sharp, superheated particles,** (photo shows alumina particles magnified 150x) traveling at high velocities, quickly wear dust collector linings, mains, downcomers, etc. Metals and most ceramics simply can't withstand this harsh abrasion. But some refractories can—even at temperatures as high as 2500°F.

# Refractories . . . where abrasion is a problem

**Unequalled resistance to abrasion** whether caused by tiny gas-borne particles or sliding steel billets—is one of the most useful properties of CARBOFRAX® silicon carbide refractories. For example, a CARBOFRAX dust collector lining on an ore sintering machine is still in use after 10 years service.

And when abrasion is combined with high temperature, the exceptional resistance of CARBOFRAX super refractories becomes even more apparent and useful. When used in the exhaust lines of gasoline catalytic cracking units in temperatures ranging around 1200°F, these refractories lasted 3 years, as compared to alloy rings which lasted for 6 months. On a gas fired extrusion mill furnace—where steel skids lasted 5 weeks—CARBOFRAX refractories lasted 156 weeks.

Wear resistance is not the only unusual property of these refractories. They also offer heat conductivity roughly 11 times that of fireclay, with sufficient hot strength to withstand 25 psi at 1720°C. CARBOFRAX refractories are but one of many super refractories pioneered by Carborundum and offering a wide range of unusual properties.

Carborundum's new magazine "Refractories" pinpoints many practical applications for these unusual products. The forthcoming issue carries a feature article on "Wear Resistance". Send for your copy today.

**CARBORUNDUM**
Registered Trade Mark

**VALUABLE INFORMATION FOR USERS OF:**

REFRACTORIES • CASTABLE CEMENTS • POROUS PLATES AND TUBES

CATALYST SUPPORTS • OXIDE, BORIDE, NITRIDE AND CARBIDE

HIGH-TEMPERATURE MATERIALS • CERAMIC FIBER

*all in the new magazine "Refractories"*

**MAIL THIS COUPON TODAY**

**Dept. A126, Refractories Division**
**The Carborundum Company, Perth Amboy, N. J.**

Please send me the forthcoming issue of "Refractories".

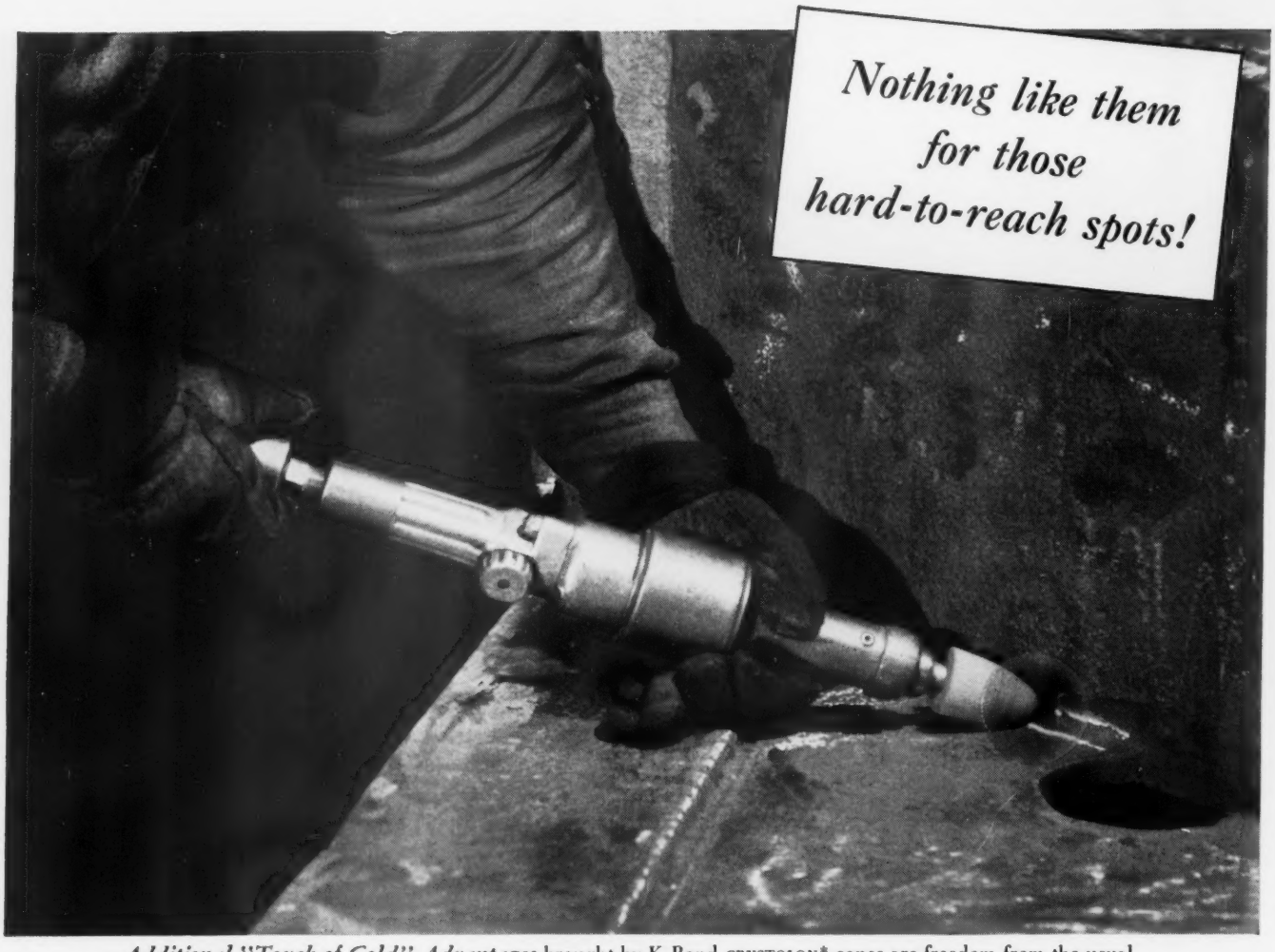
Name _____ Title _____

Company _____

Street _____

City _____ Zone _____ State _____

*Circle 574 on Inquiry Card—Page 217*




*Additional "Touch of Gold" Advantages* brought by K Bond CRYSTOLON* cones are freedom from the usual grooving and chipping of vitrified cones on gray and malleable iron applications.

# Norton K Bond† Cones

## *resist grooving and chipping . . . add the saving "TOUCH of GOLD" for snagging gray and malleable iron*

The Norton K Bond is the most radically improved vitrified bond ever developed for slow speed snagging of gray and malleable iron.

That's why, every time K Bond CRYSTOLON wheels or cones go to work for you, you can count on these profit-boosting "Touch of Gold" advantages:

1. Faster, freer cutting action
2. Much longer wheel life
3. Less frequent dressing
4. Hold corners better
5. Consistently duplicated

### *K Bond Cones Stand Up Better*

In particular, CRYSTOLON cones made with this outstanding bond overcome the usual tendency of vitrified bond cones to groove excessively and chip off when snagging difficult places on gray or malleable iron castings. On these jobs the following reports are typical of very many received from foundries:

*"K Bond cones hold form with no chipping. Best ever used."*

*"Excellent cutting action. Cones lasted an average of 10 hours — longest service life we ever got."*

*"These cones last us 50% longer than any others and they're tops for fast cutting."*

*"For durability and cut, K Bond wheels are far the best we ever tested."*

See your Norton Distributor about arranging a test of K Bond CRYSTOLON cones and wheels in your own plant. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. W-1624

*Making better products...*
*to make your products better*

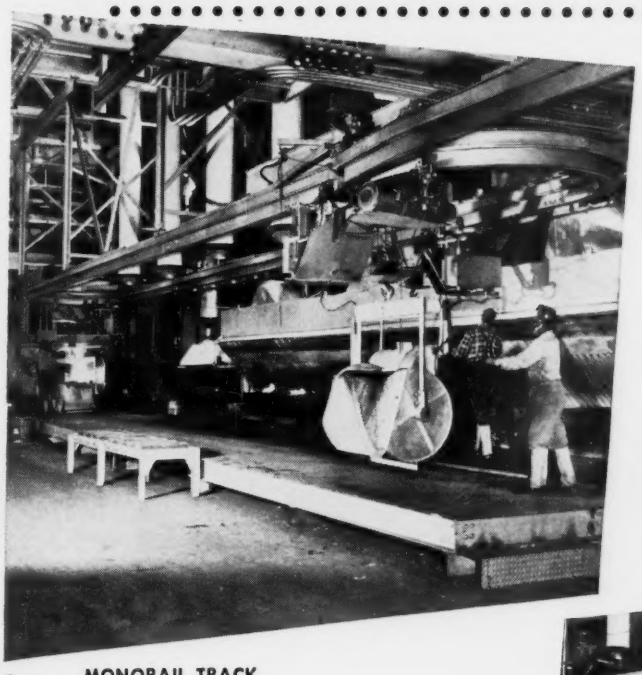
NORTON

**and its BEHR-MANNING division**

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

†Patent applied for

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries



MONORAIL TRACK

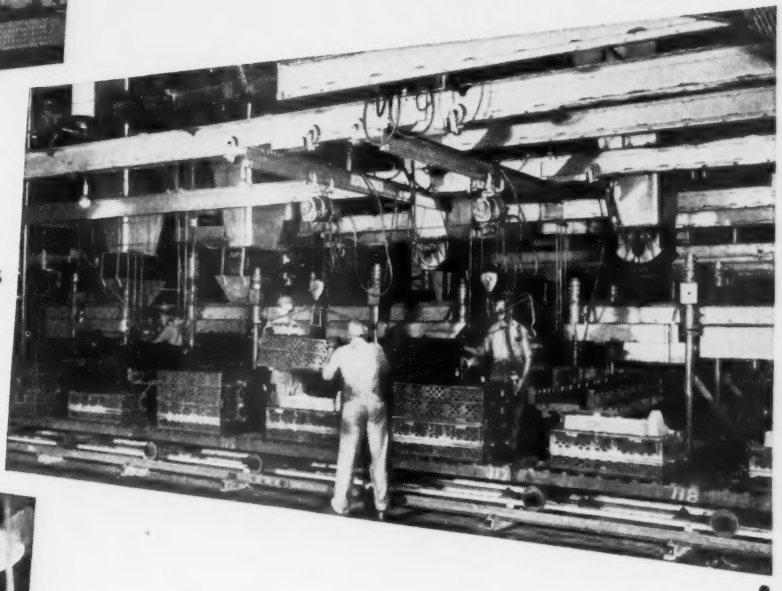
use

# MONORAIL SPECIFICATIONS

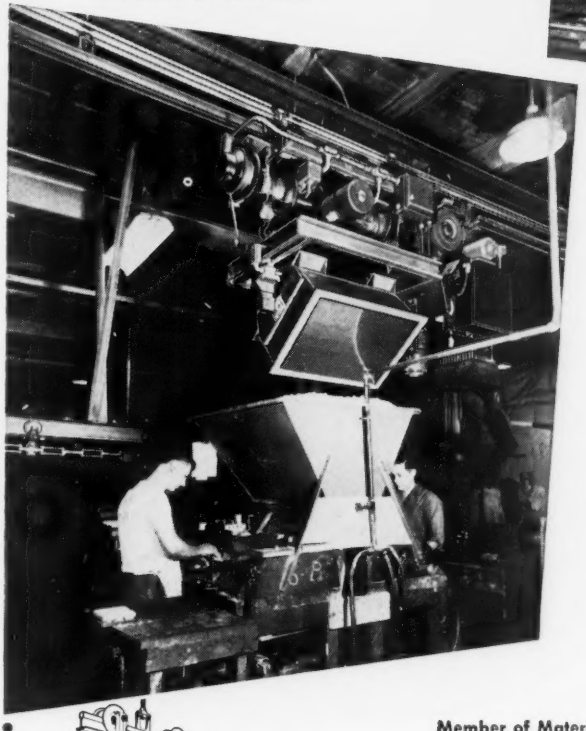
for

# MAXIMUM SAFETY MINIMUM MAINTENANCE

MONORAIL CRANES



AUTOMATIC DISPATCH



By following the guide prepared by members of the MonoRail Manufacturers Association when purchasing materials handling equipment, you are assured of getting maximum safety and minimum maintenance and still satisfy your operating requirements.

The guide represents the efforts of the combined experience of all the engineers of the association members. The specification guide has just been published.

A copy of these specifications will be forwarded on request. Write also for a copy of the American MonoRail Bulletin C-1 describing hundreds of successful solutions to handling problems.

Member of Materials Handling Institute — MonoRail Association

AMERICAN OVERHEAD HANDLING EQUIPMENT

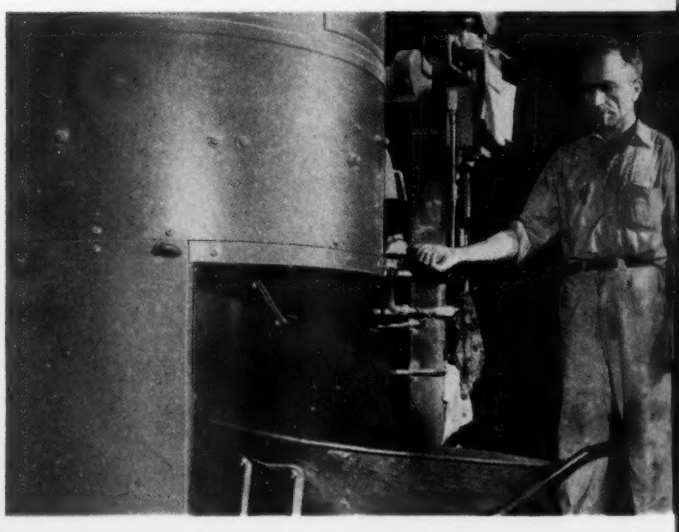
MONORAIL COMPANY

13104 ATHENS AVENUE
CLEVELAND 7, OHIO

[IN CANADA—CANADIAN MONORAIL CO., LTD., GALT, ONT.]

# CASTING INGENUITY SOLVES MONEL IMPELLER

INDUCTION CAST BY WOLLASTON BRASS



*"If the muller were a maintenance problem our operation would be impaired"* . . . says E. F. Tibbetts of this No. 1-F Simpson Mix-Muller used to prepare all the green sand at Wollaston Brass and Aluminum Foundry Inc., North Quincy, Mass.

# PROBLEM THAT STUMPED PUMP DESIGNERS

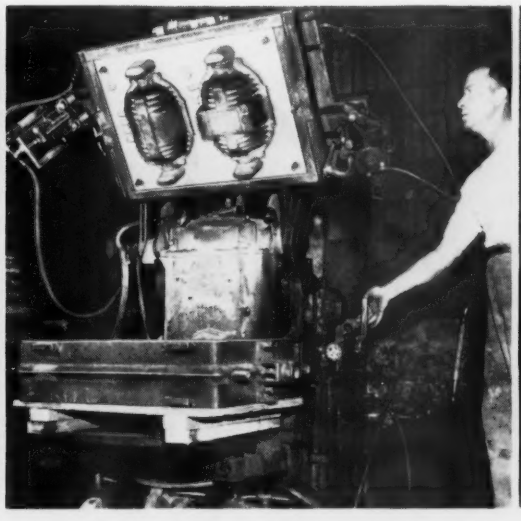
## SIMPSON MIX-MULLERS contribute to versatility of Wollaston Brass speciality foundry!

Wollaston Brass and Aluminum Foundry Inc. of North Quincy, Mass. do a brisk speciality jobbing business with a clean, modern and well equipped shop that is set up to handle unusual stainless, monel and nickel jobs. A recent contract, calling for a special high nickel alloy steel pump impeller, was completed by Wollaston—after many foundries, including the pump designer, had found it impossible to produce through their own casting facilities.

Owners Edward H., Frank and R. C. Tibbetts will tell you that careful sand control and precise metallurgy are the secret to Wollaston's unique reputation in producing these specialized jobs. That's why the Simpson Mix-Mullers were put into service upon their recent change-over from natural to synthetic sand. Of their year-old Number 1-F Simpson Mix-Muller E. F. Tibbetts, vice president, of the Wollaston firm has this to say: "*This muller has been in constant use every day since its installation without any difficulty whatever. With continued increase in overall business volume our change-over from natural sand to synthetic has been all the success we hoped for . . . If the muller were a maintenance problem our operation would be seriously impaired. We are glad we decided on a Simpson.*"

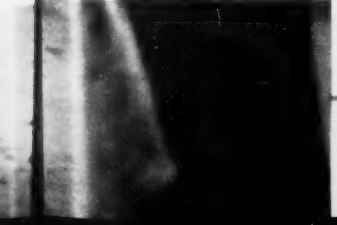
Specialized metal jobs may not be numbered among *your problems*. But if you cast metals your sand requires, and will get, the same thorough, efficient *controlled* mulling and the same dependable day-in and day-out service that has made the Simpson Mix-Muller a partner in the progress of improved metal casting—the world over.

SIMPSON PORTO-MULLER sees heavy duty in preparing all core sand used by this speciality foundry.



CAREFUL CONTROL helps Wollaston Brass maintain an enviable record of success on highly specialized casting jobs.

NO. 1-F MIX-MULLER is equipped with time and labor saving, straight lift Bucket Loader and accurate water additions meter.

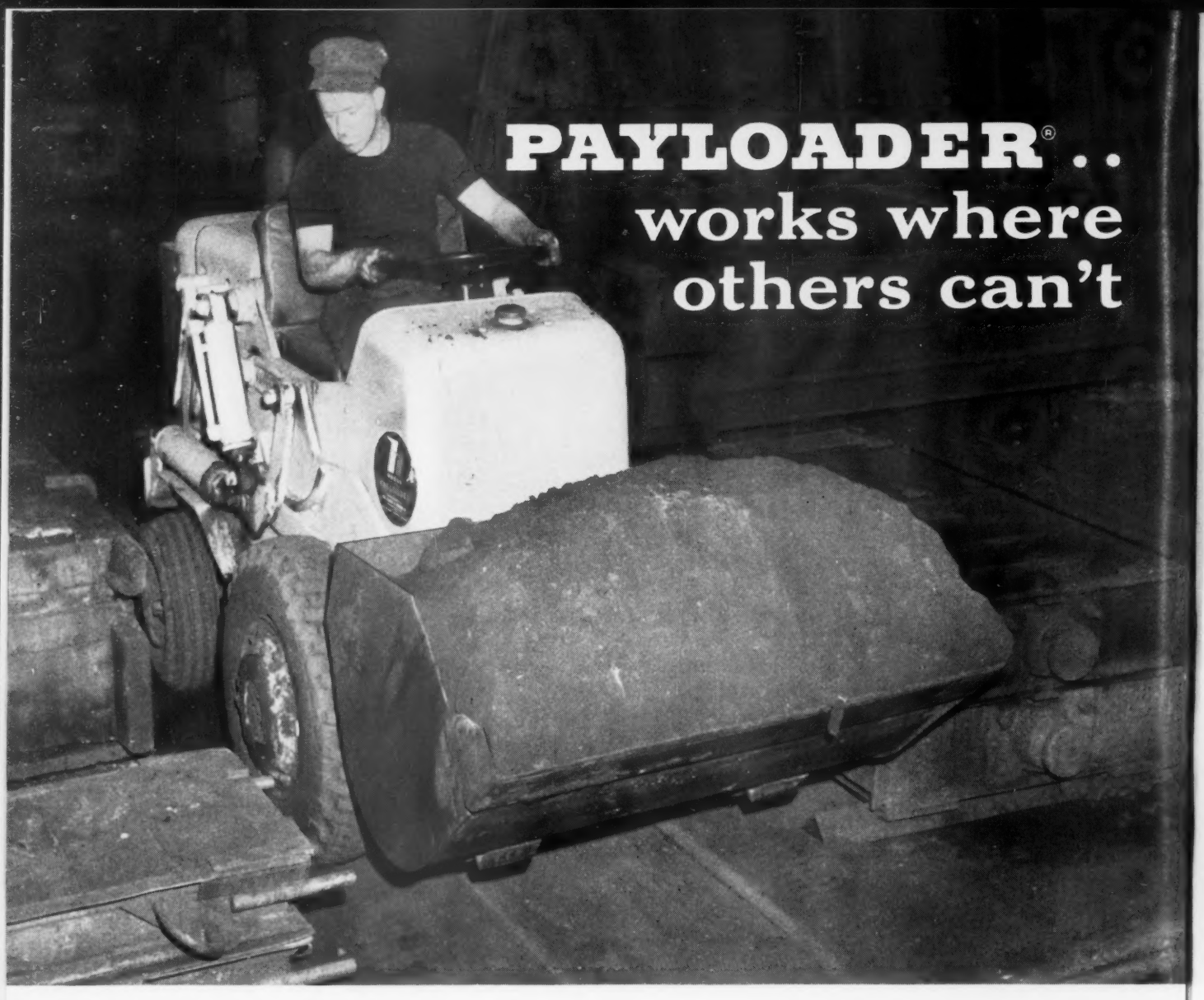


**NATIONAL Engineering Company**

646 Machinery Hall Bldg. • Chicago 6, Illinois

SIMPSON MIX-MULLERS • SHELL-MULL • MOLDER'S HELPER
TIMEMASTER • SCREENMASTER • COMPLETE ENGINEERING SERVICE

*Circle 577 on Inquiry Card—Page 217*




## What makes a PAYLOADER® best for your jobs?

**Shortest turning radius**
**Highest dumping height**
**Biggest bucket (18 cu. ft. Payload)**
**Hydraulic-load-shock-absorber**
**40° bucket tip-back at ground level**
**Exclusive, one-lever bucket control**

Many foundry and metal-working customers tell us that a big advantage of the model HA "PAYLOADER" for their operations is its ability to travel and work where others can't — to negotiate narrow aisles, boxcar doors and corners. Yet this "PAYLOADER" boasts a bigger bucket (18 cu. ft. payload) and can get more, carry more and deliver more tonnage than any tractor-shovel anywhere near its size. An extra plus for any model HA owner is the number of attachments that are available to handle extra jobs — sweeper, fork lift, pusher fork, snow plow.

Owners *expect* more from a "PAYLOADER" and they *get* more because more "PAYLOADER" tractor-shovels have been built and are in service than all other wheeled tractor-shovels put together. There's a "PAYLOADER" size and type to fit *your* needs and a nearby Distributor ready to serve you right.

**THE FRANK G. HOUGH CO.**
703 SUNNYSIDE AVE., LIBERTYVILLE, ILL.
Send data on "PAYLOADER" tractor-shovels
☐ HA (18 cu. ft.) and HAH (1 cu. yd.)
☐ Larger models to 2¼ cu. yd.

Name _____
Title _____
Company _____
Street _____
City _____
State _____
10

SAY "HUFF"

**PAYLOADER®**
MANUFACTURED BY
**THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.**
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

*Circle 578 on Inquiry Card—Page 217*

# Late News

November 26, 1956

**OUTLOOK:** Most purchasing executives look for good to excellent business conditions for the rest of 1956 and at least into the first quarter of 1957. This opinion is given in the latest business survey of the National Association of Purchasing Agents. Other high lights reported include: Continued high production; steady rate of new orders; slackening in the upward trend of commodity prices; slight drop in inventories and caution in forward buying; small gain in employment.

**CONTROLS:** Recent international disturbances have prompted the prediction that the government probably would apply various forms of industrial controls quickly in the event of a national emergency. These could apply to prices, wages and supplies of materials. For this reason foundries frequently are urged by industry spokesmen to have their pricing formulas in order. Those companies which failed to do so prior to the last application of price control found themselves in a bad squeeze.

**AFS TRAINING PROGRAM:** Establishment of the AFS Training and Research Institute was approved by directors of the American Foundrymen's Society on Nov. 16. In a new building to be erected at society headquarters in Des Plaines, Ill., it will conduct short refresher courses for foundry personnel. Training instructors will be drawn from industry and schools. The institute will be directed by a board consisting of the AFS president, vice president and immediate past president, plus four men appointed from industry. Subsequently an expanded program of technical research also will be carried on in the new building.

**ICI ELECTS:** K. W. Thompson, K. W. Thompson Tool Co., New Hyde Park, N. Y., is the new president of the Investment Casting Institute. Also elected at the institute's recent annual meeting in Detroit were: Vice president, P. W. Schipper, Howard Foundry Co., Milwaukee; treasurer, V. S. Lazzara, Casting Engineers Inc., Chicago. Newly elected directors are Mr. Lazzara, C. R. Whittemore, Deloro Smelting & Refining Co., Deloro, Ont., and R. C. Kramer, Kolcast Industries Inc., Cleveland.

**MANPOWER STUDY:** A further survey of future manpower and training needs of the foundry industry will be started shortly by the U.S. Department of Labor. The study will cover nonmechanized shops, supplementing one conducted a year ago of mechanized foundries. A representative group of foundries, selected by an Industry Advisory Committee, will be visited by Labor Department representatives to obtain desired information.

**CAR SHOPS BUSY:** Freight car builders had a backlog of 122,250 cars on Nov. 1. This is nearly twice the number on order a year ago. Production rose in October with deliveries of 5666 cars, against 3444 in September. Orders also increased, totaling 6532, compared with 3949 the month before.

**PERSONALS:** Paul L. Arnold, resident manager, Chattanooga, Tenn., plant of United States Pipe & Foundry Co., on Jan. 1 will become resident manager of the Decoto, Calif., plant. He will be succeeded at Chattanooga by Howard M. Barker, production superintendent there . . . C. J. Wilson, recently works manager, Mergenthaler Linotype Co., Brooklyn N. Y., has been appointed director of manufacturing, the Bullard Co., Bridgeport, Conn. . . . George W. Baille Sr., vice president, Quaker City Foundry Inc., Salem, O., has been re-elected president of the Industrial Information Institute, Youngstown, O.

**OBITUARY:** Rushton E. Shirley, 56, secretary and general manager, Indiana Foundry Corp., Muncie, Ind., died Nov. 19 . . . James C. Romines Sr., 76, former co-owner and plant superintendent, Southern Pipe & Foundry Co., Knoxville, Tenn., died Nov. 12 . . . Maxwell H. Tielke, 54, former vice president and treasurer, Crucible Steel Casting Co., Cleveland, died

Nov. 10 . . . Allison W. Laytham, 51, president, William P. Laytham Sons Co., Paterson, N. J., died Nov. 12 . . . Mike Machacek, 84, president, Northfield Foundry & Machine Co., Northfield, Minn., died Nov. 12 . . . Elmer W. Hintz, 55, production manager, Crucible Steel Casting Co., Milwaukee, died Nov. 16 . . . James L. Mahon, 75, former district manager, Detroit plant, American Car & Foundry Co., New York, died Nov. 14.

**LITHIUM INSTITUTE:** Establishment of the American Lithium Institute Inc. to conduct research on lithium and its compounds has been announced by American Potash & Chemical Corp., Foote Mineral Co. and Lithium Corp. of America. The institute has been formed to meet the need for a central organization staffed to direct research on problems of an industrywide nature. It also will act as an agency to correlate and disseminate technical information on lithium.

**MATERIAL HANDLING EQUIPMENT:** Sales of material handling equipment in 1957 will be 10 per cent higher than the record- breaking 1956 sales. That's the prediction of the Material Handling Institute Inc., Pittsburgh. It already is estimated that 1956 will surpass the former record year, 1955, by 25 per cent.

**ALUMINUM SUPPLY:** Supplies of primary aluminum next year will be expanded by the enlarged production capacity and also by curtailed stockpiling. The government's decision to defer shipments to the national stockpile during the first half of 1957 will divert about 200,000 tons to industrial users. Primary aluminum production through October totaled 1,385,000 tons, against 1,291,000 tons a year ago.

**MISCELLANY:** Norton Co. has acquired control of Abrasivos Irmaos Meyer, S. A., Sao Paulo, Brazil, manufacturer of coated abrasives, grinding wheels, and abrasive grain . . . Monsanto Chemical Co. has raised the price of ferrophosphorus $10 a ton . . . Orders placed for industrial furnaces during the first ten months this year were 27 per cent ahead of 1955, based on reports by member companies of the Industrial Heating Equipment Association. October sales were off 9 per cent from last year . . . Utah becomes the 46th chapter of the American Foundrymen's Society.

# Prices of Foundry Metals and Coke

(As of Nov. 26, 1956)

## FOUNDRY COKE

(Per net ton, f.o.b. ovens)

| | |
|---|---|
| **BEEHIVE** | |
| Connellsville | $17.50-18.50 |
| **OVEN** | |
| Birmingham | $27.60 |
| Buffalo | 29.50 |
| Detroit | 29.50 |
| Erie, Pa. | 29.50 |
| Indianapolis | 28.75 |
| Kearny, N. J. | 28.75 |
| Milwaukee | 29.50 |
| Montreal, Que. | 30.00 |
| Neville Island (Pittsburgh) | 28.25 |
| New England, deld. | 30.55 |
| Painesville, O. | 29.50 |
| Philadelphia | 28.50 |
| St. Louis | 28.50 |
| St. Paul | 28.50 |
| Swedeland, Pa. | 28.50 |
| Terre Haute, Ind. | 28.75 |

## PIG IRON

(Per gross ton f.o.b. furnace)

| | No. 2 Foundry | Malleable |
|---|---|---|
| Birdsboro, Pa. | $65.00 | $65.50 |
| Birmingham | 59.00 | 63.00 |
| Buffalo | 63.00 | 63.50 |
| Chicago | 63.00 | 63.00 |
| Cleveland | 63.00 | 63.00 |
| Duluth | 63.00 | 63.00 |
| Erie, Pa. | 63.00 | 63.00 |
| Everett, Mass. | 63.75 | 64.25 |
| Fontana, Calif. | 70.50 | .... |
| Geneva, Utah | 63.00 | .... |
| Granite City, Ill. | 64.90 | 65.40 |
| Lone Star, Tex. | 59.00 | .... |
| Neville Island (Pittsburgh) | 63.00 | 63.00 |
| Steelton, Pa. | 65.00 | 65.50 |
| Swedeland, Pa. | 65.00 | 65.50 |
| Toledo, O. | 63.00 | 63.00 |
| Troy, N. Y. | 65.00 | 65.50 |
| Youngstown, O. | .... | 63.00 |

## NONFERROUS INGOT

(Cents per pound, carlots)

**BRASS AND BRONZE:** Red brass, No. 115, 35.00; tin bronze, No. 225, 46.00; No. 245, 41.50; high-leaded tin bronze, No. 305, 38.50; No. 1 yellow, No. 405, 27.50; manganese bronze, No. 421, 30.75.

**ALUMINUM:** 99 per cent plus primary ingots 27.10. Secondary No. 12 alloy 23.50-24.00. Deoxidizing grades: No. 1 23.75; No. 4 21.75.

**MAGNESIUM:** 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

**COPPER:** Electrolytic 36.00, delivered Connecticut valley.

**ZINC:** High grade 14.85 delivered. Die casting alloy No. 3, 18.00, No. 2, 19.00, delivered.

## IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

| | No. 1 Heavy Melting Steel | No. 1 Cupola Cast | Heavy Breakable Cast | Clean Auto Cast | Machinery Cast | Malleable | Short Steel Rails |
|---|---|---|---|---|---|---|---|
| Birmingham | $46.00-47.00 | **$52.00-53.00 | ..... | ..... | ..... | ..... | $74.00-75.00 |
| Boston* | **51.00-52.00 | **45.00-45.50 | ..... | ..... | **46.00-47.00 | ..... | ..... |
| Buffalo | 59.00-60.00 | **49.00-50.00 | ..... | ..... | **54.00-55.00 | ..... | 77.00-78.00 |
| Chicago | 63.00-66.00 | 50.00-51.00 | ..... | 55.00-56.00 | 55.00-56.00 | 70.00-71.00 | 83.00-86.00 |
| Cincinnati* | **59.00-60.00 | **48.00-49.00 | **47.00-48.00 | ..... | **58.00-59.00 | ..... | **80.00-81.00 |
| Cleveland | 64.50-65.50 | 59.00-60.00 | 50.00-51.00 | 57.00-58.00 | 60.00-61.00 | 71.00-72.00 | 86.00-88.00 |
| Detroit* | **59.00 | **48.00 | **41.00 | **53.00 | ..... | **52.00 | ..... |
| Los Angeles | 55.00 | **62.00 | ..... | ..... | ..... | ..... | ..... |
| New York* | 53.00-54.00 | 46.00-47.00 | 48.00-49.00 | ..... | ..... | ..... | ..... |
| Philadelphia | 59.00 | 52.00-54.00 | 57.00 | ..... | 58.00-59.00 | 68.00 | 81.00-82.00 |
| Pittsburgh | 62.00-63.00 | 52.00-53.00 | 50.00-51.00 | ..... | 59.00-60.00 | ..... | 80.00-82.00 |
| St. Louis* | 56.00 | 50.00 | 46.00 | 53.00 | ..... | ..... | 84.00 |
| San Francisco | 54.00 | 60.00 | 42.00 | 60.00 | 60.00 | ..... | ..... |
| Seattle | 54.00 | 50.00 | 48.00 | ..... | ..... | ..... | ..... |

*Brokers' buying prices. **F.o.b. shipping point

# For Cleaner Surfaces, Better Shakeout, Try WHITEHEAD'S NEW LYQUAFLOUR

**Our new plant has just been completed at Irwin, Penna., to produce the new DOUBLE-STRENGTH LYQUAFLOUR. This compound of a special hydrocarbon and woodflour improves castings and mold conditions for all types of metals. Highly recommended for the advantages listed below:**

- One sand additive controls both peel and expansion
- Good shakeout saves sand
- Imparts highest flowability to sand mixture to give pattern true finish
- 2% initial treatment of sand and as little as ¼ of 1% to reactivate does the job
- Replaces any carbon or hydrocarbon materials now used
- Eliminates dust at the muller
- Castings peel excellently which reduces cleaning room time
- Reduces penetration and burn-on
- Overcomes sand expansion defects, maintains good compression strength
- Improves molding, "feel", and "moldability"
- No rigid control required
- Permits hard ramming
- Less ramming required, more molds per hour
- Less temper water needed

## Whitehead Brothers COMPANY

Established 1841

**NEW YORK OFFICE**
324 West 23rd St., New York 11, N. Y.

**NEW ENGLAND OFFICE**
17 Exchange Place, Providence, R. I.

***Manufacturers of***

**LYQUAGRIP**
Ready-to-use core paste

**DUO RESIN**
Binder for baking with controlled oven temperatures

**JOINT SEAL**
Plastic compound for perfect sealing

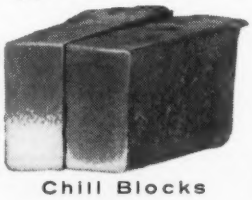
**LYQUAFACE**
The liquid sand grain coating

**DOB-IT**
Ready-to-use core mudding compound


*Circle 579 on Inquiry Card—Page 217*

# Machining Rate Increased 25% by Adding "SMZ" Alloy

Machining the gas burner castings above was often very difficult due to chilled corners and edges. These chilled spots caused excessive tool wear and breakage, interrupting production in the machine shop. When the foundry received complaints about the poor machinability of these castings, they added 3 pounds of "SMZ" alloy per ton to the molten iron in the ladle. The "SMZ" alloy cut chill depth from an average of ½ in. to approximately ⅛ in., as shown in the chill specimens below. The effect of this treatment was noticed immediately in the machine shop: the machining rate was increased by 25 per cent and tool breakage was eliminated.



Chill Blocks

This is one of many examples where a small addition of "SMZ" alloy markedly reduced the chilling properties of cast iron without sacrificing the mechanical properties of heavier sections. "SMZ" alloy is a strong, carefully balanced inoculant containing 60 to 65 per cent silicon, 5 to 7 per cent manganese, and 5 to 7 per cent zirconium. Besides reducing the chill in cast iron, "SMZ" alloy is used in the production of high-strength iron because it increases tensile and transverse properties.

Your nearest ELECTROMET office will be glad to give you additional information about the advantages of using "SMZ" alloy. Ask for the booklet, "SMZ Alloy—An Inoculant for Cast Iron," which gives actual examples of the use of this important ladle addition alloy.

## ELECTRO METALLURGICAL COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

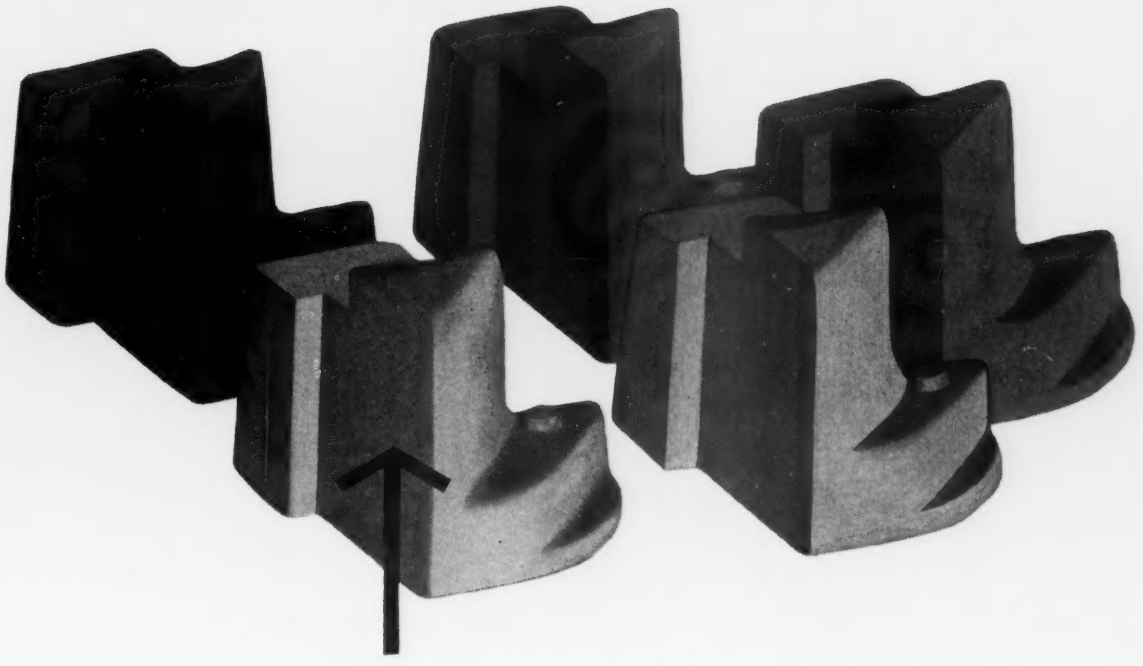
OFFICES: Birmingham · Chicago · Cleveland · Detroit
Houston · Los Angeles · Phillipsburg, N. J. · Pittsburgh · San Francisco

In Canada: Electro Metallurgical Company, Division of Union Carbide Canada Limited, Welland, Ontario

The terms "Electromet" and "SMZ" are registered trade-marks of Union Carbide and Carbon Corporation

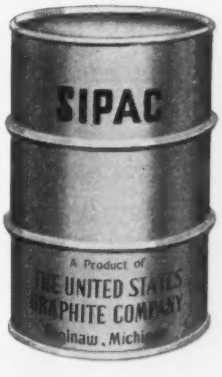
HALF A CENTURY OF DEVELOPMENT IN FERRO-ALLOYS AND METALS
50th Anniversary
Electromet
1906 ··· 1956

# SIPAC T.M. non-carbonaceous core coating—the latest addition to THE UNITED STATES GRAPHITE CO. line



## distinctive golden color identifies this highly refractory, low-cost, clean-to-handle coating

Sipac, a new core coating that contains no carbon and gives cores fine smooth surfaces, has just been made available to foundries by The United States Graphite Co. Sipac is a complete formula already in suspension, and needs only the addition of water to the correct Baumé before application (the suspension is so stable that you may dilute it to a Baumé of 32 without settling). A highly refractory material that will not flake off, Sipac completely seals core surfaces and works well with any foundry sand. It anchors to cores exceptionally well, and gives a penetration of 3 to 5 grains with very low cost per covered area. Sipac is clean to handle and its bright golden color makes cores highly visible which is helpful when placing cores in the drag. Sipac is ideal for steel, malleable, and non-ferrous castings as well as gray iron, because it is non-carbonaceous and inert and will not react with any molten metal. Sipac is a concentrated paste which mixes readily with water, and you can apply the diluted wash by swab, dip, brush, or spray methods. Sipac will result in a fine finish for your castings, and you can use this one wash for all jobs. Shipped in 55 gallon drums. Write today for details about Sipac or any of the other United States Graphite Company core or mold coatings.




214

## THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

Says George Edwards, president,
WOODRUFF & EDWARDS, Elgin, Illinois

## *"Producing top-quality alloys . . . up to 14 heats per day"*

# with DETROIT ROCKING ELECTRIC FURNACE

In its 15-hour day, the Woodruff & Edwards foundry gets as many as three stainless steel heats, plus ten or eleven other heats, such as ductile iron, Ni-Resist or Ni-Hard.

The 89-year-old foundry entered the alloy metals field two years ago. Says foundry president George Edwards, "We installed a Detroit Electric Furnace as the least expensive way . . . only one-third the initial expenditure required for any of the other alloy production system installations."

Ted Haines, metallurgist in charge of the furnace, operates with two extra shells to eliminate downtime. Shell changeover from ductile iron to stainless steel is accomplished in fifteen minutes or less.

Production of 8,000 pounds of quality alloys per day has repaid nearly half the furnace investment in two years. "This has pleased the front office," says Haines.



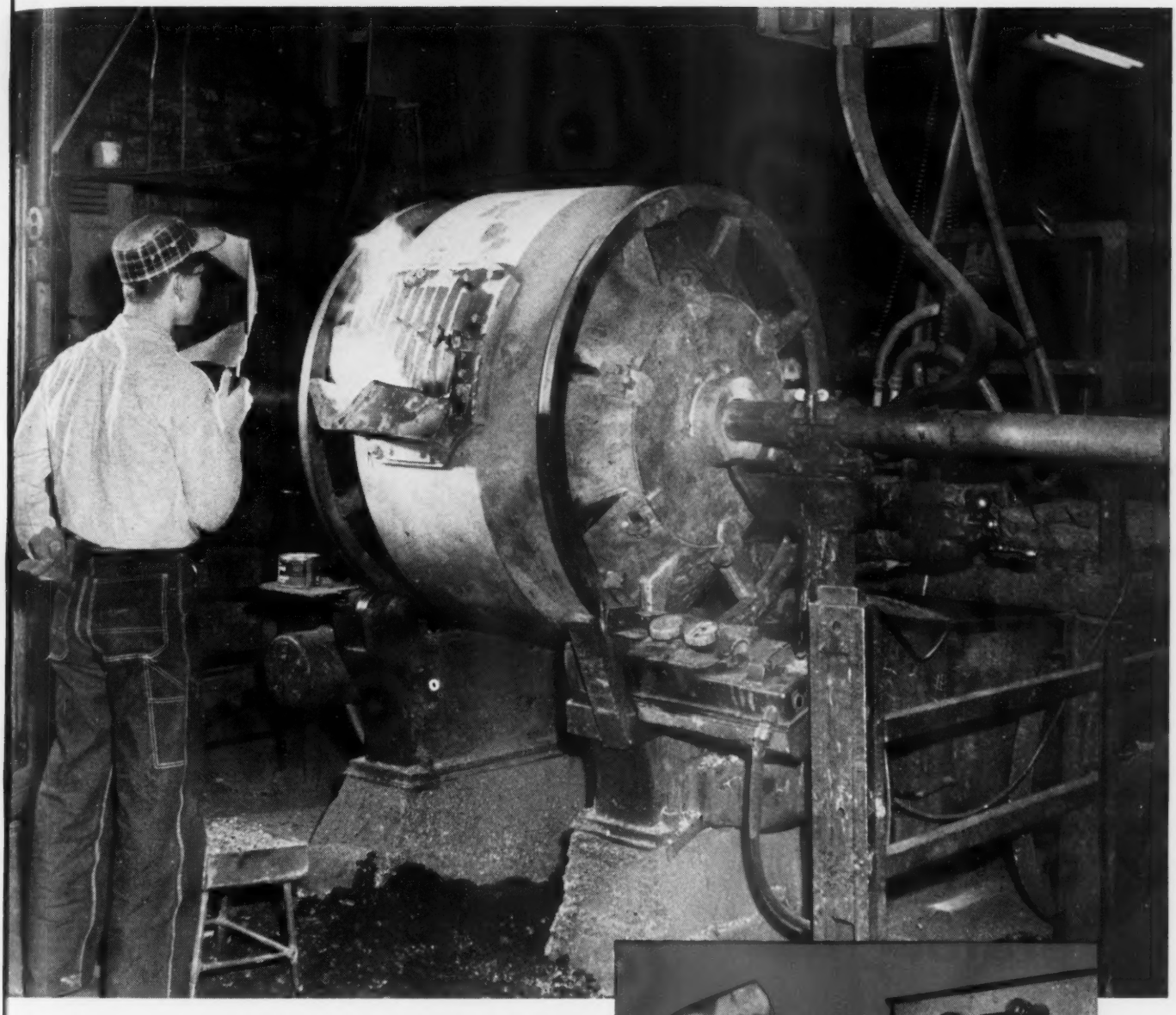
Detroit Rocking Electric Furnaces are doing many foundry jobs well—melting bronze, brass, steel, iron, ductile iron and other alloys. Detroit's indirect arc provides fast, controlled melting. Automatic rocking control assures homogeneity of the melt and greater utilization of heat. Molten metal is washed over a large area of the refractory by the constant rocking action.

Detroit Electric Furnace capacities range from 10 to 10,000 pounds. Send us your operating data—let our engineers show you how a Detroit Electric Furnace will meet your needs.

## DETROIT ELECTRIC FURNACE

**Kuhlman Electric Company,**

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.



*Furnace operator "sight checks" heat in Detroit Electric Furnace at Woodruff & Edwards foundry.*

*Write for free book!*

"High Production with Consistent Quality" provides operational data and ratings on all Detroit Electric Furnaces. Write today—no obligation!

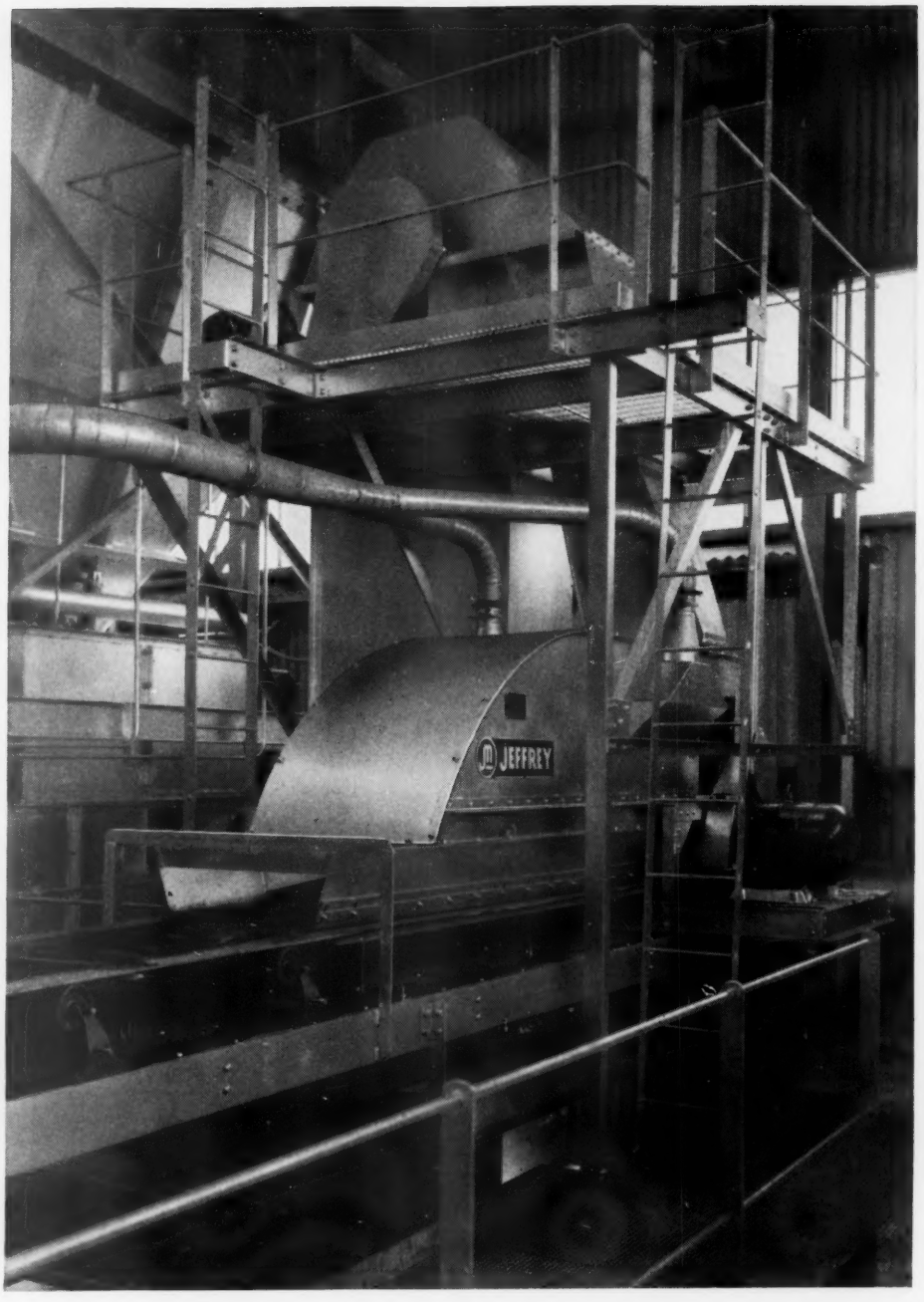
# DIVISION

## Bay City, Michigan

MEMBER FEMA

*Foundry metallurgist Ted Haines checks control board for exact picture of furnace performance. He keeps permanent analysis reports, says, "It's a very fine record."*

*Treated sand is delivered onto a conveyor here for distribution to the molders' stations.*




# For most efficient sand preparation, add a **JEFFREY Aerator-Blender**

IT AERATES, cools, blends and fluffs up the sand—gives extra care in sand preparation which means a lot to your molders. Sand that has gone through the Jeffrey Aerator-Blender is more uniform, contributing to higher quality workmanship.

In operation, sand from the muller, or in certain cases directly after screening and temper addition, is fed against the rapidly revolving rotor. The hardened steel mingler bars mix and blend the sand, throwing it forward through the air inside the hood for cooling and aeration.

The Jeffrey Aerator-Blender is highly efficient, reasonable in first cost and free from the excessive wear and maintenance which often characterizes machines of this nature. Jeffrey foundry engineers will assist you in choosing equipment to suit your requirements.

**THE JEFFREY MANUFACTURING COMPANY**
**Columbus 16, Ohio**

**JEFFREY**

**CONVEYING • PROCESSING • MINING EQUIPMENT • TRANSMISSION MACHINERY • CONTRACT MANUFACTURING**



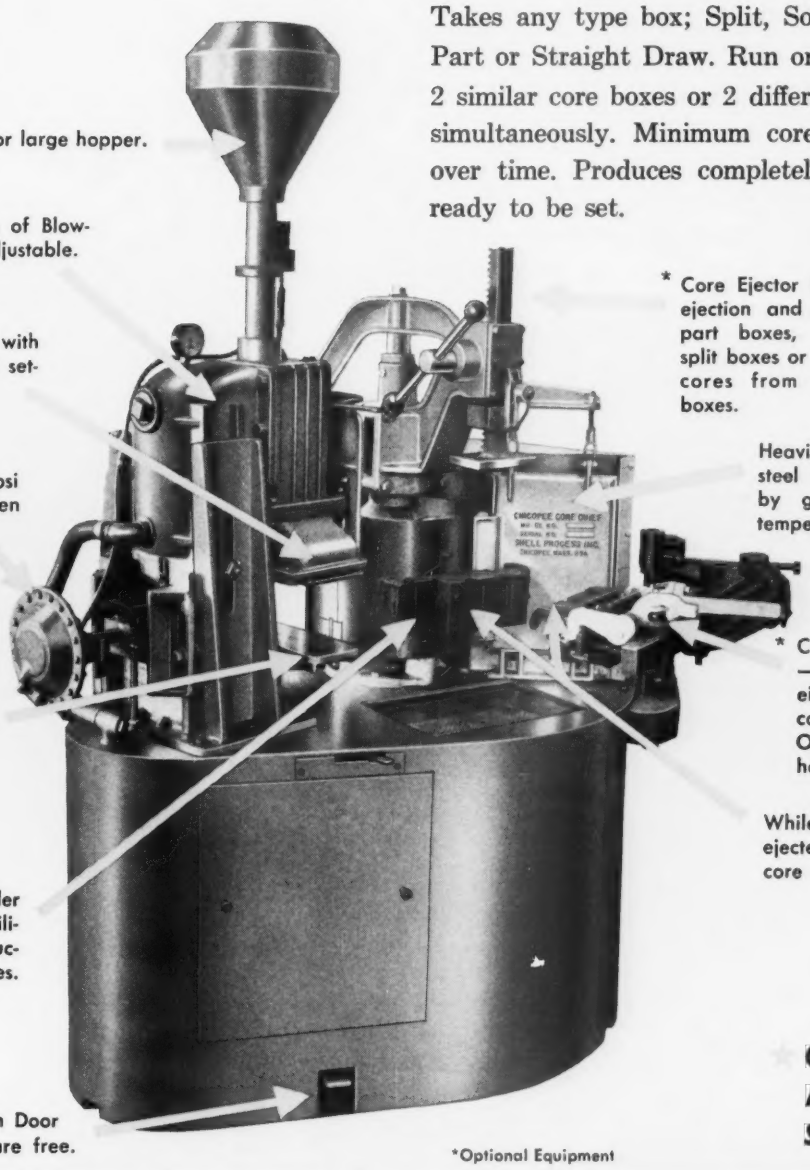
*Circle 583 on Inquiry Card—Page 217*

# SHELL CORE BLOWER

## *Chicopee* CORE CHIEF... A DUAL CORE BOX MACHINE

### *Features Versatility and Ease of Operation*

The most versatile shell core blower available. Takes any type box; Split, Solid, Hinged, 3 Part or Straight Draw. Run one core box — 2 similar core boxes or 2 different core boxes simultaneously. Minimum core box change-over time. Produces completely cured cores ready to be set.



Adaptor for large hopper.

Vertical position of Blow-head easily adjustable.

Dovetailed Blowplate with cam release for fast set-up time.

Air Cylinder exerts 950 psi assuring tight seal between core box halves.

Air operated Bottom Clamp assures positive seal between blow plate and core box. Also adaptable for heated mandrels when producing controlled thickness cores.

Rotatable Core Box Holder — Rotates 180° to facilitate dumping in production of hollow shell cores.

Foot operated Oven Door operator's hands are free.

* Core Ejector Press — For ejection and handling 3 part boxes, horizontally split boxes or ejecting pin cores from solid core boxes.

Heavily insulated stainless steel lined oven, heated by gas with automatic temperature control.

* Core Box Opening Fixture — Cores ejected from either or both halves of core box quickly, easily. Operator does not touch hot core box.

While cores are being ejected from one box, 2nd core is being cured.

*Optional Equipment

**CORE BOX MAKING AND ENGINEERING SERVICE AVAILABLE**

**WRITE TODAY**
for free folder and additional information on shell core making with the Chicopee Core Chief.

## SHELL PROCESS, INC.

*Manufacturers of Shell Molding Machines and Allied Equipment*

**365 BLISS STREET • WEST SPRINGFIELD • MASS.**

# NOW!

## WHEELABRATOR®

# SUPER TUM

7 CU. FT. 14 CU. FT. 28 CU. FT.

WHEELABRATOR®

## SUPER TUMBLASTS

NOW the 28 cu. ft. Super Tumblast is supplemented by two smaller sizes incorporating the same cost-saving features . . . the 7 cu. ft. and the 14 cu. ft. models. With this range of sizes we can handle large work and small work in any kind of production situation. The phenomenal success of the 28 cu. ft. model, in effecting super-savings in maintenance and operating costs, has already produced orders for

# BLAST comes in 3 sizes

## TO MAKE SUPER SAVINGS IN MORE PLANTS

only WHEELABRATOR® *Super Tumblasts* offer these features for Operating and Maintenance Savings

### super-capacity wheel

The new Super-Capacity Wheel throws more than twice as much abrasive as any similar sized wheel previously used. Combined with a blast pattern spread over the entire blast chamber, it provides faster, more uniform cleaning with less power per pound of abrasive thrown. A new, strain-free blade holder and easy-access wheel guard housing makes service easier, faster.

### super-efficient separator

The Super-Efficient Separator effects new savings in abrasive use and wear on machine parts. With 300% greater efficiency, it removes all sand and scale that would cause excessive machine wear but does not remove abrasives until they are too small for use. Location of the separator directly below the cleaning chamber also simplifies maintenance of the unit.

### super-tight cleaning chamber

This is the tightest steel flight conveyor ever used in blast equipment. There are no open spaces where small work can be caught and damaged. There are no areas where work can jam and displace liners, interfere with operation of the door, or break the abrasive-tight seal. This helps to reduce downtime to the minimum. (The 7 cu. ft. machine can be equipped with either rubber or steel apron conveyor.)

### super-sealed door

The new Super-Sealed Door keeps all abrasive in the machine and provides trouble-free operation on any type of work. The power-operated, reinforced, one-piece door will withstand impacts from either side without jamming or warping. Traveling in tracks that are integral with the side frames of the machine, it forms an abrasive seal as strong as the machine itself.

### *LONG-LYFE* parts throughout

Every high-wear point within the Super Tumblast is equipped with genuine Wheelabrator Long-Lyfe Parts. These parts are made of a patented alloy steel fully heat-treated for maximum possible wearable life. They last many times longer than ordinary parts to save hours in replacement time, machine downtime, ordering and handling time, and to reduce shipping and storage costs.

the NEW sizes — and the list is snowballing. A partial list of Super Tumblast customers includes: *Unitcast Corp., Dayton Malleable Iron Co., Indiana Forge & Machine Co., Malleable Iron Fittings Co., Hallstead Iron Foundry Co., American Forge Div., Standard Forgings Corp., Walworth Co., The Wilmington Casting Co., Hughes Tool Co., American Forge Div., Canada Iron Foundries, Ltd., Northern Indiana Brass Co., Landers, Frary & Clark, Bethlehem Steel Corp., American Hoist & Derrick Co., Harrisburg Steel Corp., Central Foundry Div. Saginaw, Mich., and others.*

*Write for complete literature today*

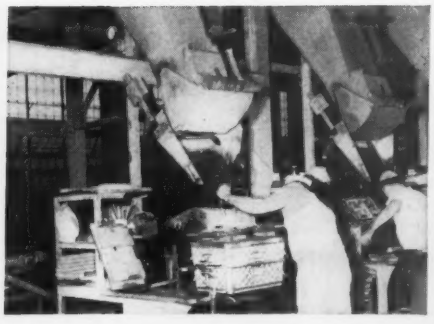
**WHEELABRATOR**
CORPORATION

505 S. Byrkit Street — Mishawaka, Indiana

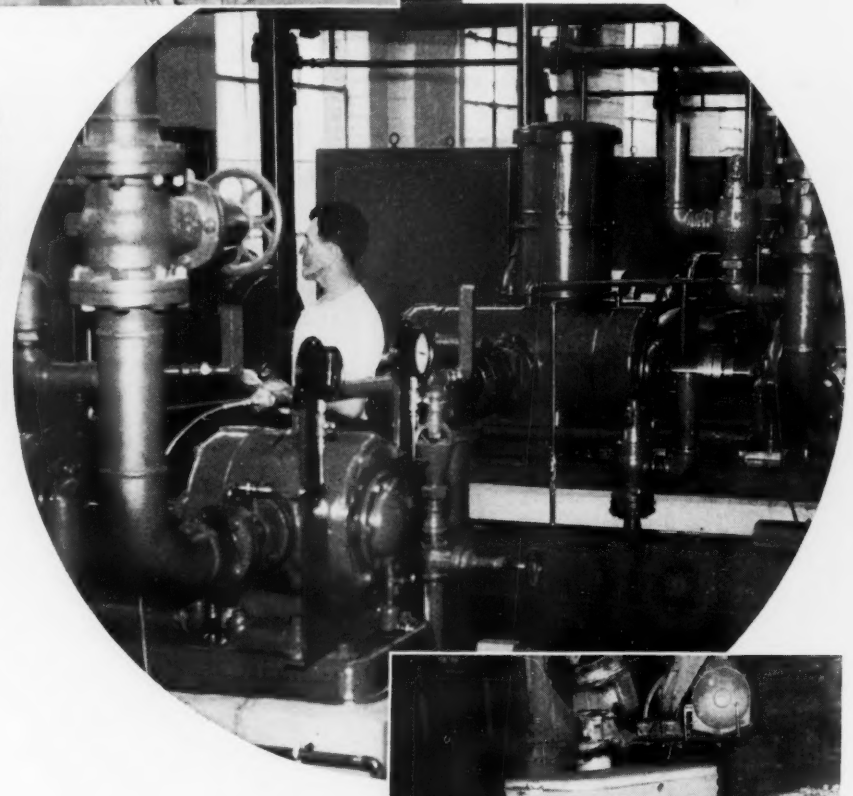
*World's Largest Builders of Airless Blast Equipment and Steel Abrasives*

Sand blasting machine, in continuous operation, requires 844 cfm to operate.

Six Fuller Compressors supply a total of 6,800 cfm at 125 psig for plant operations at Textile Machine Works, Reading, Pa.

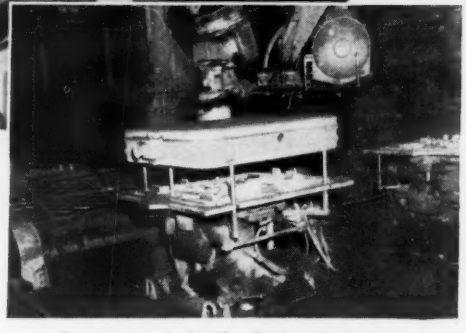


Molders use compressed air to operate hopper-gates, vibrate sand evenly throughout mold, remove pattern plate, squeeze sand in finish, and clean up.



# *Air*-Powered Foundry Operations

## *. . . at Textile Machine Works*



Compressed air lifts flask off pattern plate for removal by hoist or crane.

Six Fuller Rotary Compressors are supplying air power for the many foundry operations at Textile Machine Works, Reading, Pa., makers of full-fashioned hosiery machinery, machine tools, etc. By utilizing air, Textile Machine Works has successfully mechanized much of its production—thereby biting deep into time consumption and improving product quality.

Fuller Rotaries are vibrationless (perfect for light foundations) and provide pulsation-free air at low cost. The Fuller-pioneered rotary principle requires a minimum of moving parts—insuring high reliability and maintaining capacities for the life of the machine (pressures up to 125 psig; capacities to 3,300 cfm).

Right now in your plant there may be a need for air power. Write for full information about Fuller Rotaries—your best bet for every air-operated device.

FULLER COMPANY GENERAL AMERICAN TRADE MARK

C296
3660

**FULLER COMPANY**
**148 Bridge St., Catasauqua, Pa.**
SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION
Chicago • San Francisco • Los Angeles • Seattle • Kansas City • Birmingham

**Fuller**
*. . . . pioneers in harnessing AIR*

**PIONEERS OF HIGH-EFFICIENCY VANE TYPE ROTARY COMPRESSORS SINCE 1930**

*For the newest in coated abrasives . . . watch BEHR-MANNING!*

A natural for polishing intricately shaped casting surfaces.

Favorites for bringing-up superior finishes in fast time.

Tops for removing flash from difficult inside contours.

# Faster, easier way to finish non-ferrous castings

With these BEHR-MANNING Coated Abrasive Belts on the job, you'll come up with consistently better finishes every time. For example, this operator (above) turns out a steady flow of cast aluminum parts in record-breaking time.

Foundries everywhere are finding BEHR-MANNING Coated Abrasive Belts the answer for superior finishes at today's increased production demands. Try them yourself, in your foundry or at a nearby BEHR-MANNING Application Room. A BEHR-MANNING Representative will gladly demonstrate. Call him today, or write Behr-Manning, Troy, N. Y., Dept. F-12.

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BEHR-MANNING ® BEHR-MANNING CO.
a division of NORTON COMPANY
NORTON ABRASIVES

# Don't ever be in doubt...

## Just call the one that's in... or talk to the one that's out!

Remember the little weather prophet that used to hang on grandma's front porch? One figure represented cloudy weather and the other fair weather. As one figure came out the other moved back in. Two Ohio Ferro Sales Executives operate the same way except that they both represent fair weather for our customers. One stays at the home office to keep things running smoothly, while the other one is in the field conferring personally with our customers and observing their problems. As soon as the "out" man comes in, the "in" man pops out.

So you see, authority to make important sales decisions for your convenience not only sits at home but it goes abroad to serve you where you are.

It all adds up to better service for Ohio Ferro-Alloy customers.

### Ohio Ferro Products

- FERRO - SILICON 25 - 50 - 65 - 75 - 85 - 90%
- SPECIAL BLOCKING 50% FERRO - SILICON
- SILICON METAL
- HIGH CARBON FERRO-CHROME
- LOW CARBON FERROCHROME
- LOW CARBON FERRO-CHROME SILICON
- FERRO - MANGANESE
- SILICO-MANGANESE
- MED. CARBON FERRO-MANGANESE
- BOROSIL
- SIMANAL
- RARE EARTH ALLOYS

### Briquets

- SILICON
- MANGANESE
- CHROME
- SILICO-MANGANESE

PHILO · TACOMA · BRILLIANT

DEPENDABILITY · QUALITY · SERVICE

*Ohio Ferro-Alloys Corporation*

*Canton, Ohio*

Chicago Detroit Pittsburgh Tacoma Seattle Denver
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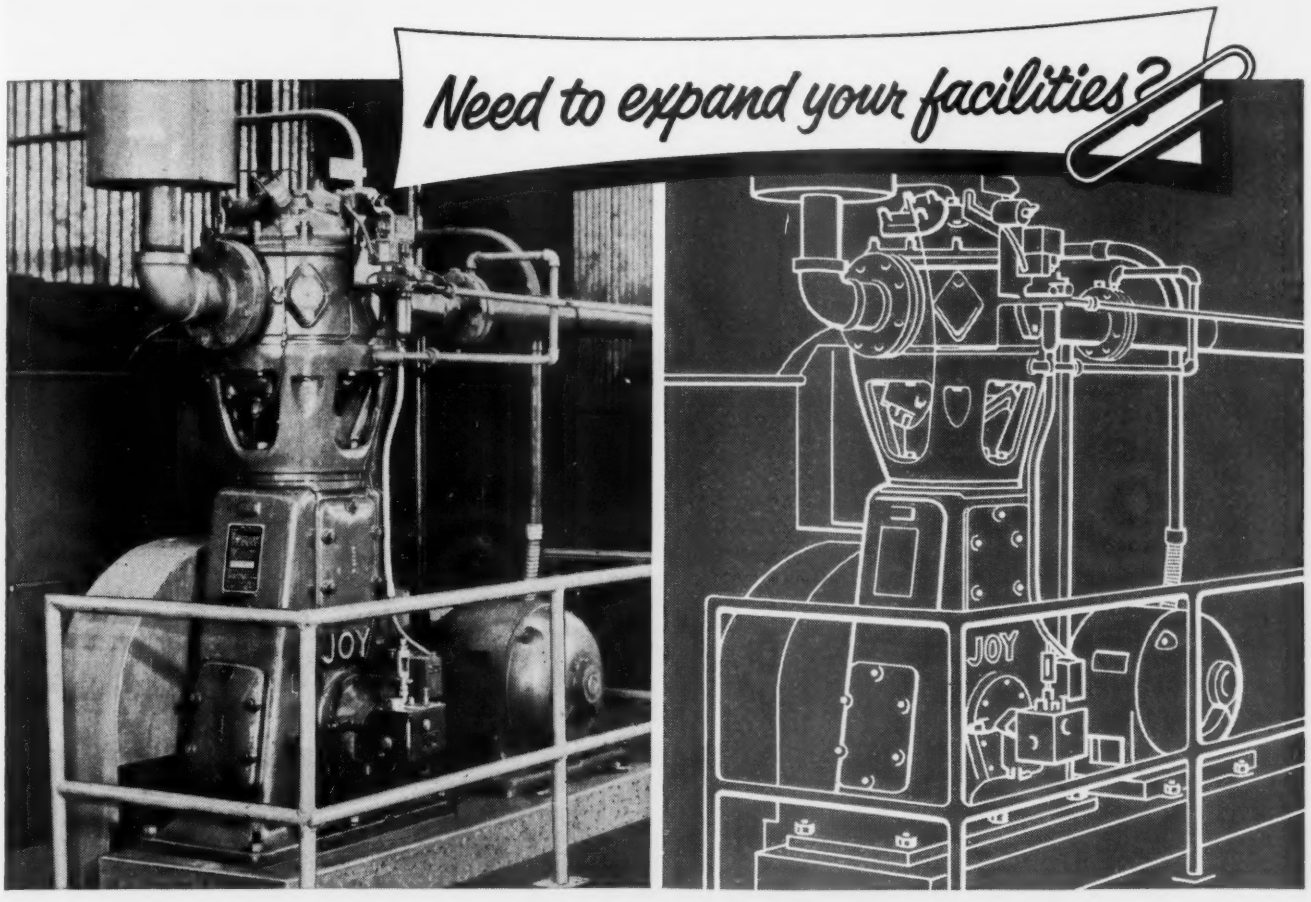



# Add compressed air power efficiently with the JOY WG-9

The Joy WG-9 *heavy-duty* vertical air compressor is a natural for supplying additional air for an existing system, either centralized or decentralized.

Because of its smooth running characteristics and the small floor area required, the WG-9 needs only a simple, block-type foundation. The average base dimensions of a larger model WG-9, *including motor,* are 7′1″ by 4′1″. This means greater capacity per square foot of floor area—42 CFM per square foot on the 100 psi rated machines.

*Thus, the WG-9 packs large compressor capacity in a small compressor area.* It is possible to install the machine in a central compressor room where unused floor space is at a premium, or in a decentralized plant location where crowding of machinery is a problem.

If you have plans for a small plant, the WG-9 is designed to give you continuous 24-hour heavy-duty service. It is also widely used to meet special requirements in larger operations, such as boosting air above standard plant pressures.

The Joy WG-9 is a water-cooled compressor, available in capacity ranges up to 881 CFM piston displacement and in pressures up to 150 psi. Standard drive is multiple V-belt. This machine can be furnished for flat belt or vee flat drive if desired.

**LARGE COMPRESSOR FEATURES INCORPORATED IN ALL WG-9 SERIES**

- Full Force Feed Lubrication
- Joy Patented "Dual-Cushion" Valves
- Anti-friction Main Bearings
- Replaceable Cylinder Liners and Crosshead Guides

Write today for full information. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

**Write for FREE Bulletin 22-13**

W&D I 5854-22

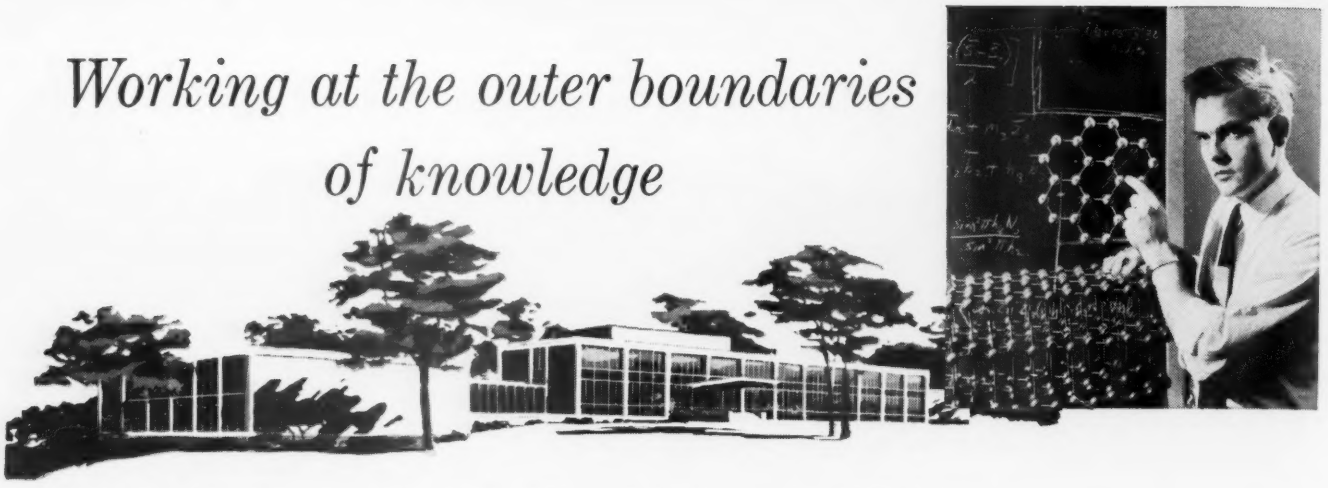
**JOY**

**SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885**

*Consult a Joy Engineer*

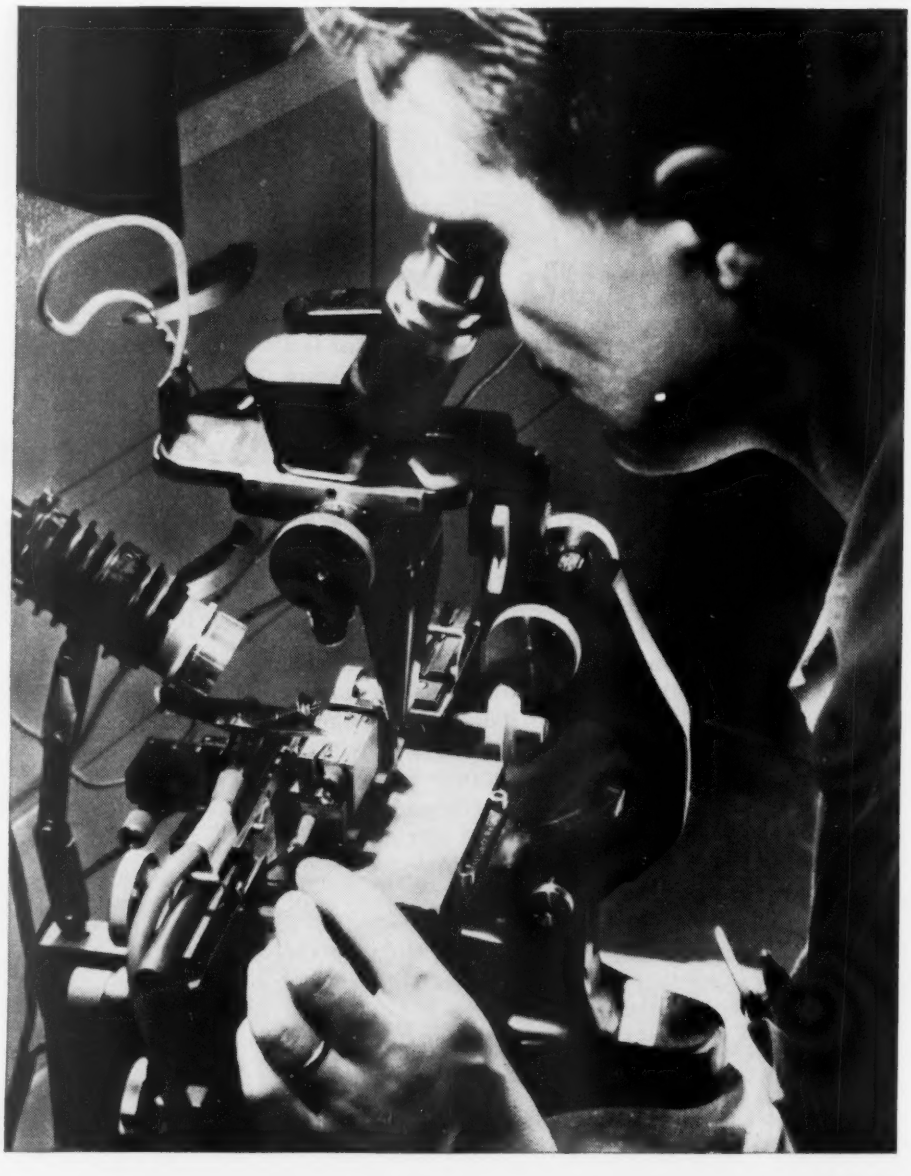
For Air and Gas Compressors, Oxygen and Nitrogen Generators, Vacuum Pumps and Boosters, Conveyors, Fans, Electrical Connectors, Hydraulic Fittings and Hose Assemblies.

# *Working at the outer boundaries of knowledge*

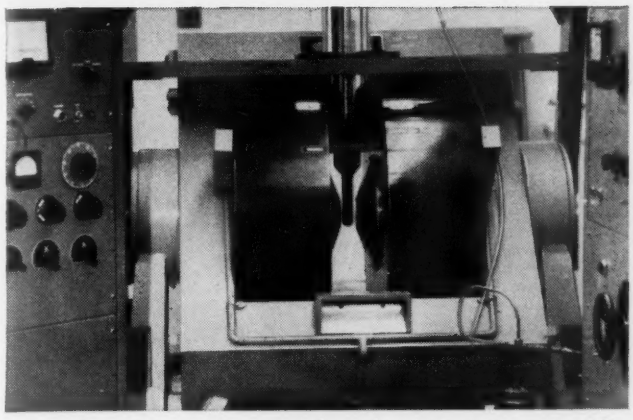


**New Research Laboratories in Parma, Ohio.** To expand its pioneering work in solid state and chemical physics, National Carbon Company has enlarged its staff of scientists and provided them with an ideal laboratory setup for creative work. Typical of their modern experimental equipment is an *arc radiation furnace* used for work on high-temperature refractories. It can bring light from a carbon arc into focus on a tiny pin-point area, *achieving an intensity* of several hundred million foot-candles — *approaching the intensity of light near the surface of the sun.*

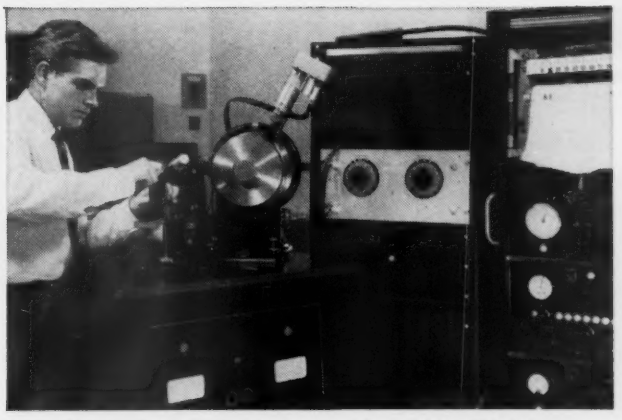
**New**



**Mechanized tweezers handle graphite crystal.** To make it into a proper experimental guinea pig, the fragile crystal must be painstakingly cut and mounted so that electrical flow can be measured along the unique crystalline directions in graphite. Experiments with pure crystals are important because all materials which we know as carbon and graphite are basically composed of the same graphite crystals being prepared here. Tremendous differences in electrical behavior and other vital properties can be traced to variations in size and arrangement of the graphite crystals in carbon products.



**Graphite must pass good-conduct test.** A tiny graphite crystal is chilled to within one degree of absolute zero, then held between poles of a powerful electromagnet, while electrical conductivity is measured in each crystalline direction — one of many ways to learn more about carbon.



**X-ray "scatter" test reveals secrets of graphite.** Testing the x-ray diffraction of carbon and graphite samples gives researchers a picture of relationships between crystals in carbon and graphite materials. This is another experimental method for probing the mysteries of carbon.

# break-through in carbon physics research

***promises future advances in furnace electrodes, linings, carbon brushes and other needs of the metal industries***

One more barrier is down. And science strides forward in the age-old quest for deeper knowledge of carbon, one of nature's more complex puzzles.

This barrier—the inability to get large graphite crystals pure enough for experimental needs — has now been overcome by researchers of National Carbon Company. Their new annealing techniques, which remove impurities from large graphite crystals, also eliminate imperfections and weaknesses in the crystalline structure.

Several research teams at the new Parma laboratories are exploiting this break-through of science. The purified crystals are being subjected to a variety of experimental tortures—electrical, magnetic and thermal. Fundamental facts about the behavior of the single graphite crystal are being gathered and pieced together like jigsaw cutouts—building up a more complete and systematic picture. In this way, our scientists will be better able to *predict* the properties of new carbon and graphite materials.

The work on single graphite crystals is only one phase of a broad research program in carbon physics. The metals industries, as large users of carbon and graphite products, will share in the gains from this work of science at the outer boundaries of knowledge. Write for new booklet titled "Research," telling more about the work at the new Parma laboratories.

*Look to* **NATIONAL CARBON**
*for leadership in carbon and graphite products*

**NATIONAL CARBON COMPANY** • **A Division of Union Carbide and Carbon Corporation** UCC **30 East 42nd Street, New York 17, N. Y.**
*Sales Offices:* Atlanta, Chicago, Dallas, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco. *In Canada:* Union Carbide Canada Limited, Toronto

# AAF
# SHARES YOUR ENTHUSIASM FOR CASTINGS!

## Foundry castings help AAF build better dust collectors at lower cost

Pictured above are a few of the many castings bought by AAF for use in the manufacture of its dust control equipment. They're used for one reason only: they get the job done *better* at *lower cost. And that's precisely the reason AAF equipment is accepted as the logical answer to foundry dust problems.*

Whether you select the AMERclone for cupola dust, the Type W ROTO-CLONE for shakeouts, or any other AAF unit for *any* foundry dust problem, you can be sure the unit will . . .

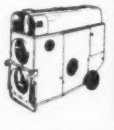
1 require small space
2 offer high collection efficiency
3 provide constant exhaust volume
4 maintain its performance over a wide range of operating conditions

Better dust control at lower cost—that's what you get with *any* AAF collector. And foundry castings are helping to provide it. For the answer to your dust problem, call your local AAF representative or write direct for Bulletin 270-A1, *Five Basic Dust Problems.*

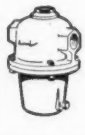
AAF herman nelson

**American Air Filter**
COMPANY, INC.

266 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.



Herman Nelson Portable Heaters



Illinois Heating Specialties

**— BETTER AIR IS OUR BUSINESS —**

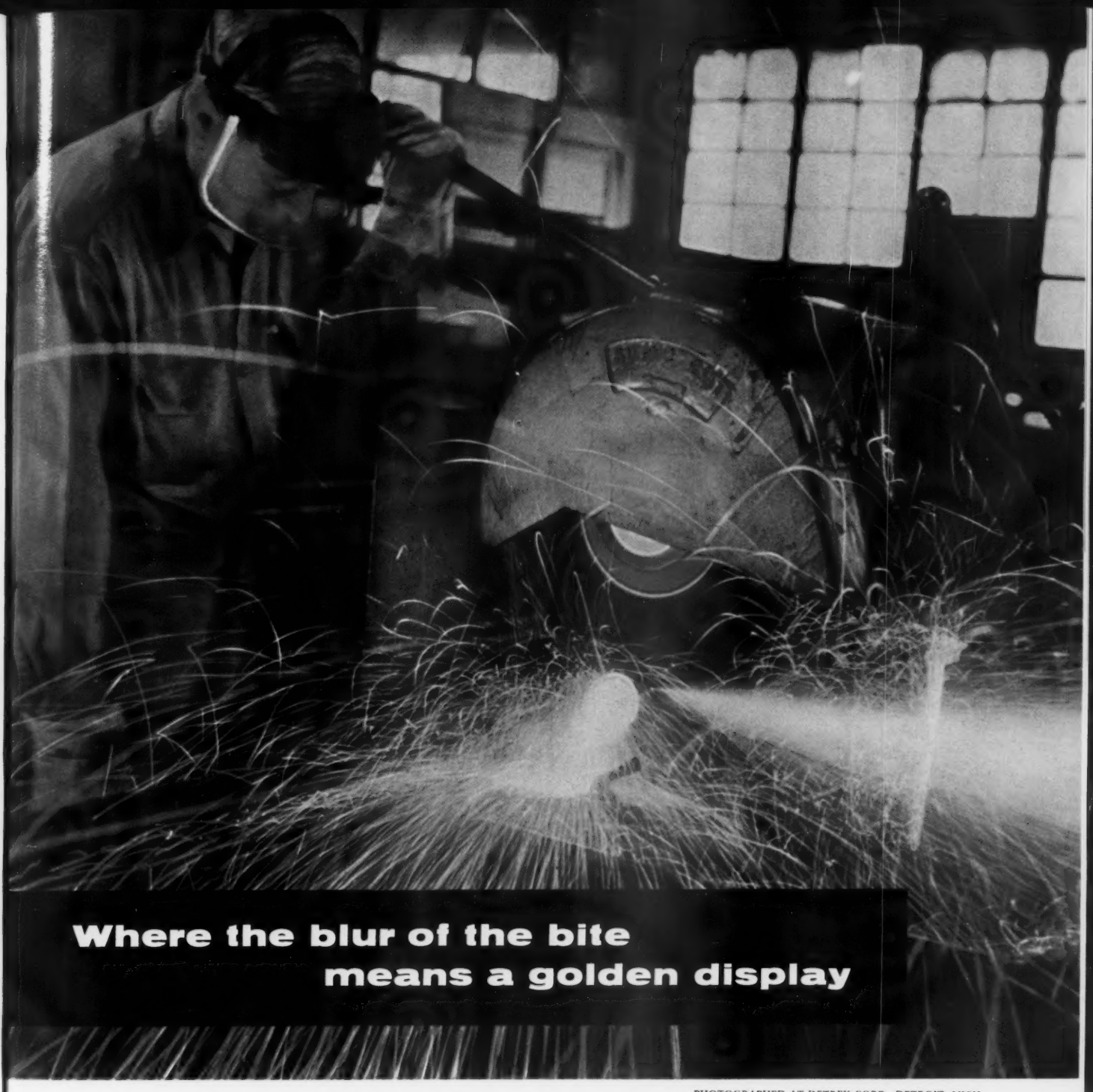
AAF Electric Furnace Hoods

AAF Type K Exhauster



Circle 591 on Inquiry Card—Page 217

Circle 592 on Inquiry Card→



# Where the blur of the bite means a golden display

PHOTOGRAPHED AT DETREX CORP., DETROIT, MICH.

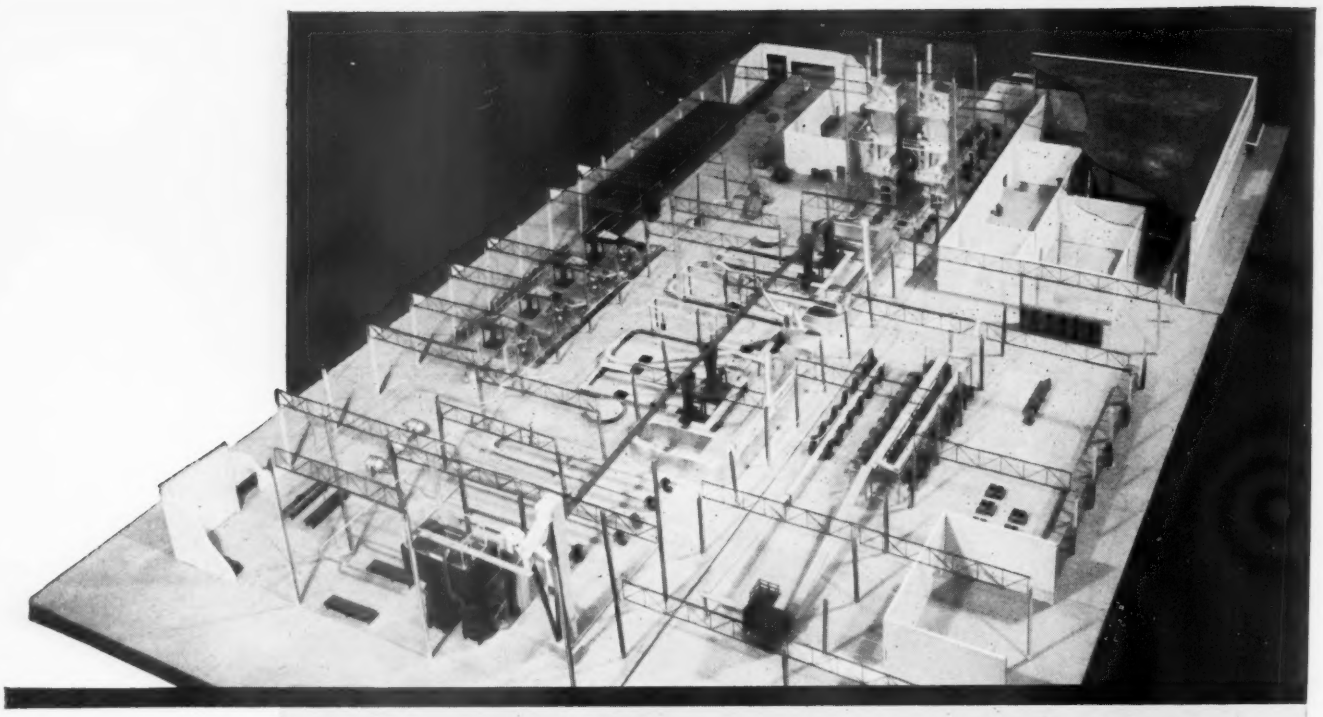
The shower of sparks tells you right away this wheel cuts faster! But that's only *one* feature of the revolutionary new B7 Bond Resinoid Cut-Off Wheel developed by CARBORUNDUM. *Want a faster cut, free from burr and burn?* B7, tested against ordinary wheels, gives it to you...with equal wheel life. *Want up to 25% longer wheel life?* B7 gives it to you...with equal quality of finish. No wonder B7 Bond Wheels are setting new standards of performance for abrasive cut-off... in production, close tolerance accuracy, economy! Have your CARBORUNDUM Distributor or salesman put a B7 blade on your chopper type machine, and see for yourself! For Bulletin A-1374 on B7 Bond Wheels, write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

**Through application "know-how" and product quality**

# CARBORUNDUM

REGISTERED TRADE MARK

**continually puts more sense in your abrasive dollar**



*Knight services include:*

Foundry Engineering
•
Architectural Engineering
•
Construction Management
•
Organization
•
Management
•
Industrial Engineering
•
Wage Incentives
•
Cost Control
•
Standard Costs
•
Flexible Budgeting
•
Production Control
•
Modernization
•
Mechanization
•
Methods
•
Materials Handling
•
Automation
•
Survey of Facilities

# AUTOMATION, SEMI-AUTOMATION, MECHANIZATION are a "must"

## for profitable operation today of the Production and Production Jobbing Foundry

This model is a proposed modernization of an existing brass foundry. Operations are automated, semi-automated, and mechanized to a high degree to insure maximum productivity per man hour, with total production up to 12,000 tons of castings per year with a balanced 2-shift operation.

A reduction of approximately 55% is anticipated in man hours per ton of good castings, from new materials to finished castings ready for the machine shop. Working conditions are to be improved and more efficient controls of melting, sand, pouring, cores, and other variables should permit high quality castings with a minimum of scrap.

This program resulted from a survey of Knight Engineers with client personnel to determine, for this problem, the most modern technological improvements and new materials, methods, and controls that could be economically justified. Knight Engineers have made hundreds of surveys in all types, classes, and sizes of foundries to assist their clients to reduce costs, improve quality, working conditions, and financial return to workers, management, and owners.

***Write for Knight Bulletin No 101, "Professional Foundry Engineering."***

EVIDENCE OF EXPERIENCE

# Lester B. Knight & Associates, Inc.

*Management, Industrial and Architectural Engineers*

MEMBER OF THE ASSOCIATION OF CONSULTING MANAGEMENT ENGINEERS, INC.

*549 W. Randolph St., Chicago 6, Ill.*

*917 Fifteenth St., N.W., Washington, D.C.*

*New York Office—Lester B. Knight & Associates, 375 Fifth Ave., New York City 16*

One of two Lectromelt Furnaces at Valley Steel Casting Company

38,715 pounds of steel were poured to produce this automotive die block at Valley Steel Casting Company, Bay City, Michigan.

# Cast 16-ton die block with two Lectromelt* Furnaces of 9-ton combined capacity

***One heat was poured from each furnace, with a touch up heat for the risers.***

Careful planning by Mr. Samuel S. Fair, Plant Manager, and Mr. George W. Barker, Chief Melter, preceded the casting of this block, said to be the largest commercial electric steel casting ever produced in Michigan. Every facility of the melting department had to be coordinated so that both furnaces could be tapped simultaneously and one quickly recharged, so that a "touch up" heat could be melted for the risers.

The Lectromelt Furnaces gave their usual excellent performance—quick turnaround, with top quality steel.

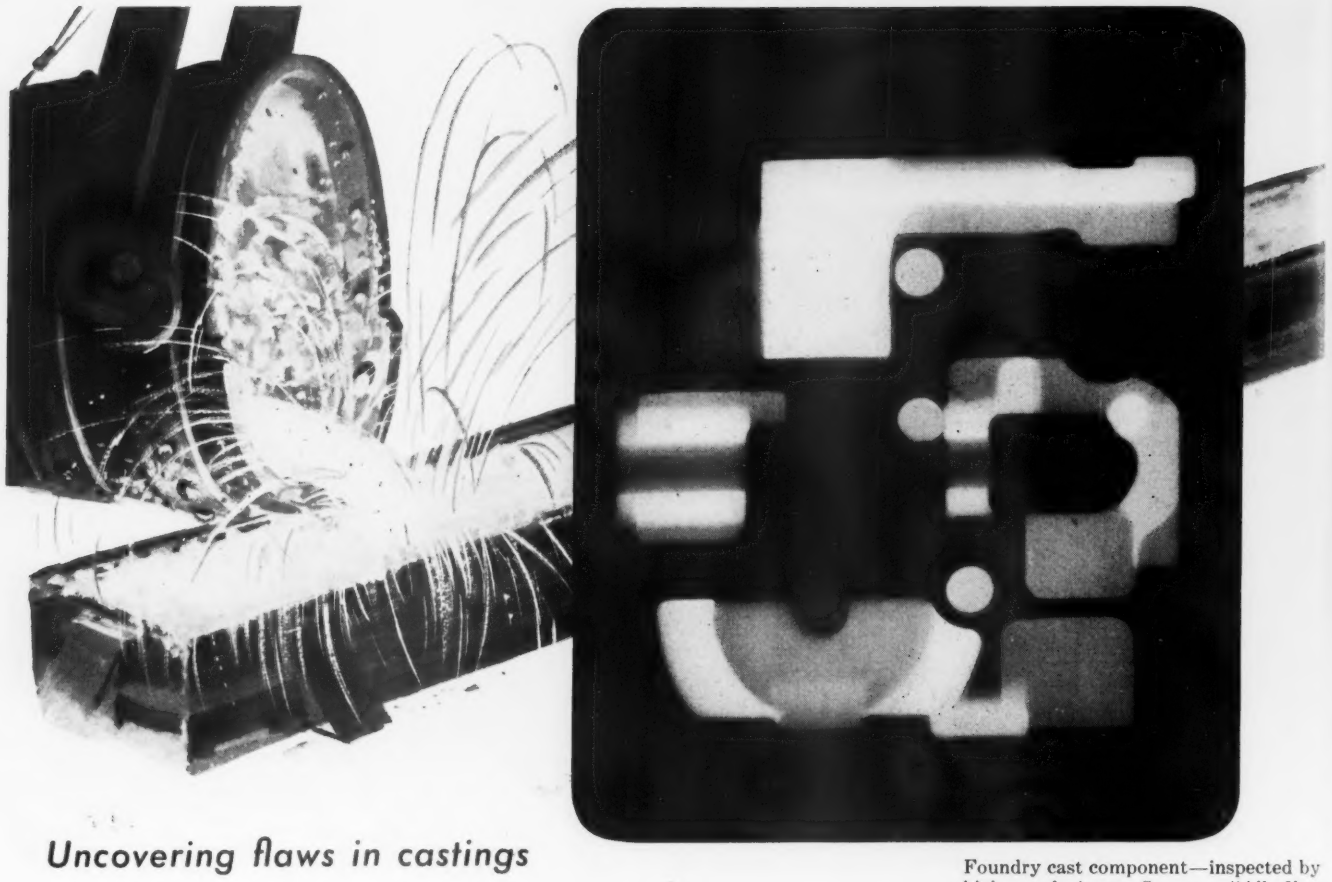
Lectromelt Furnaces are built sturdily to take such pushing for production; you see the results with lower upkeep costs. And while you're crowding on the power, Lectromelt's pinpoint control lets you hold analyses to exacting specifications.

Catalog 9-A describes these furnaces. For a copy, write Lectromelt Furnace Company, 314 32nd Street, Pittsburgh 30, Pennsylvania (a McGraw Electric Company Division).

Manufactured in . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa . . . JAPAN: Daido Steel Co., Ltd., Nagova

*REG. T. M. U. S. PAT. OFF

WHEN YOU MELT... Lectromelt



*Uncovering flaws in castings (before customers can)*

Foundry cast component—inspected by high-speed Ansco Superay "A" film.

# Ansco watches over quality for foundries

**THE RIGHT FILM FOR EVERY X-RAY NEED:**

**SUPERAY "A"**
**Versatile! A "Workhorse" film!**

**SUPERAY "B"**
**Highest contrast for maximum definition!**

**SUPERAY "C"**
**High speed for production-line inspection.**

**THE RIGHT CHEMICALS FOR PERFECT PROCESSING RESULTS:**
**Liquadol, Liquadol Replenisher, Liquafix**

With the introduction of Ansco X-Ray films—the first designed for quality control in industry—radiographic inspection gained new attention from foundrymen.

*Here's why.* With high-speed Ansco Superay "A" you can examine large lots of castings and forgings on a partial or even 100% basis—swiftly, non-destructively. And you can actually detect flaws of less than 1% at certain thicknesses.

As a result, you insure quality right in your shop, furnish proof of quality to your customers, and enhance your reputation for reliability. And Ansco Superay "A" is only one of *three* fine Ansco X-Ray films for industry.

If you're broadening your use of radiography . . . or establishing it for the first time, *specify Ansco.* Ansco films and chemicals are backed by over a century of skill, by experience on a broad variety of accounts (serviced, always, on a personal basis). Let Ansco watch over *your* quality.

*America's oldest maker of photographic materials . . .* **Ansco**

***A Division of General Aniline & Film Corporation, Binghamton, N. Y.***



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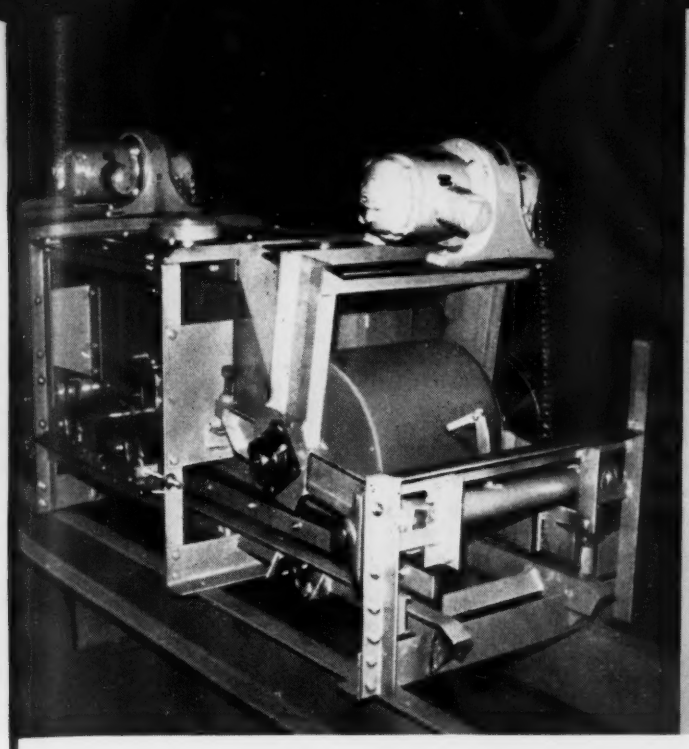
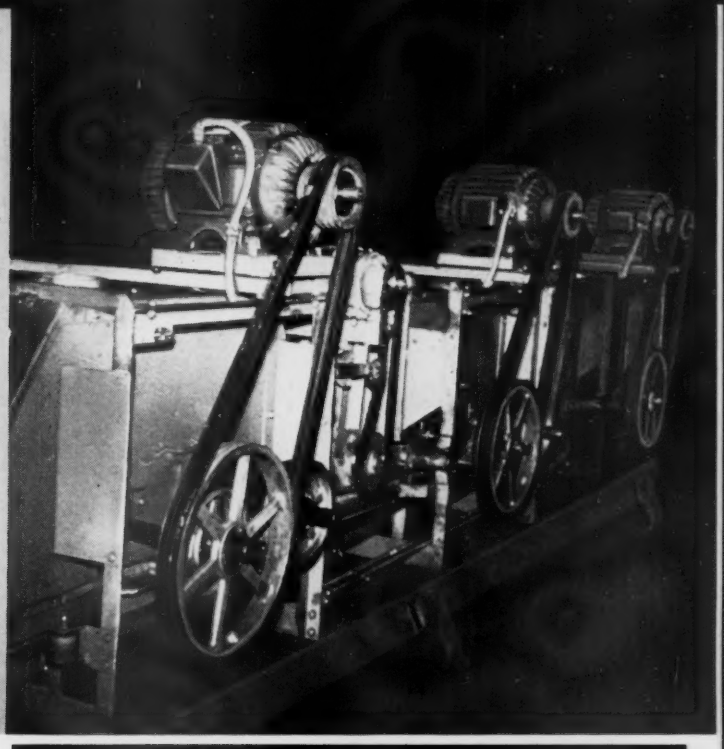




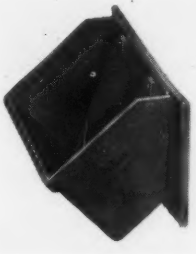
# GET UP TO 85% MORE—AND BETTER—SAND, WITH...

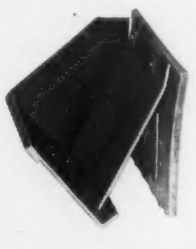
## PK Mixer-Muller
for better sand conditioning

### IT EMPTIES EVERY TIME
*and every time it empties, it* **SAVES YOU MONEY!**

Your bankroll is taking as bad a beating as your buckets—if you have to kick, bang and batter them constantly to get them clear of jammed or frozen plugs of sand or other granular loads.

Loads *can't* stick in PEKAY *M-T-Matic* buckets, even if frozen or close-packed! The separately mounted stripper plate applies irresistible leverage to bucket contents—*empties completely* on every trip! You handle *more* material at the same or higher belt speeds—cut belt replacements too!





Separately mounted back automatically acts as stripper-plate to assure *complete* emptying. Irresistible leverage develops as bucket goes over top pulley, sweeping contents entirely clean. Buckets have standard pickup capacity. Double mounting makes belts last much longer.

***the patented***
### PEKAY M-T-MATIC ELEVATOR CONVEYOR BUCKET

***Available in all standard sizes***

Thousands of *M-T-Matics* now in use are making money for users everywhere, handling sand, cement, similar materials. Easy to install on any elevator conveyor. Quick deliveries!

**Write today for low prices!**

## EASILY INSTALLED RIGHT INTO YOUR PRESENT CONVEYOR SYSTEM

Day in and day out, foundries are getting up to 85% more sand volume with their PEKAY *Mixer-Mullers*—and at the same time, cutting operating costs sharply! Skilfully designed cutter wheels assure free-flowing sand, with lumps eliminated and with sand temperature reduced; and proper mulling continuously delivers sand in perfect condition for molds, which means a big cut in scrap losses. What's more, the amount of bonding clay and Bentonite which must be added drops sharply.

Other profits show up quickly, too, because power costs are reduced, and because maintenance costs are so much less with this easy-to-inspect, easy-to-service unit. The Mixer-Muller is strongly built but compact—and made to fit on your conveyor line without difficulty.

Yet with all these advantages, PEKAY *Mixer-Mullers* cost you less to buy—and less to install. In fact, it usually takes only about 100 man hours to put the unit in place. No wonder more and more foundries of all types and sizes are installing these efficient units!

★ **Write today for more detailed information about *Mixer-Mullers* and other PEKAY equipment and services for better sand-handling at lower costs.**

*Specialists in Foundry Sand-Handling Engineering & Equipment*

**PEKAY MACHINE & ENGINEERING CO. INC.**

871 N. SANGAMON STREET CHICAGO 22, ILLINOIS

*M-T-MATIC Elevator Conveyor Buckets TROFF-O-MATIC Conveyors*

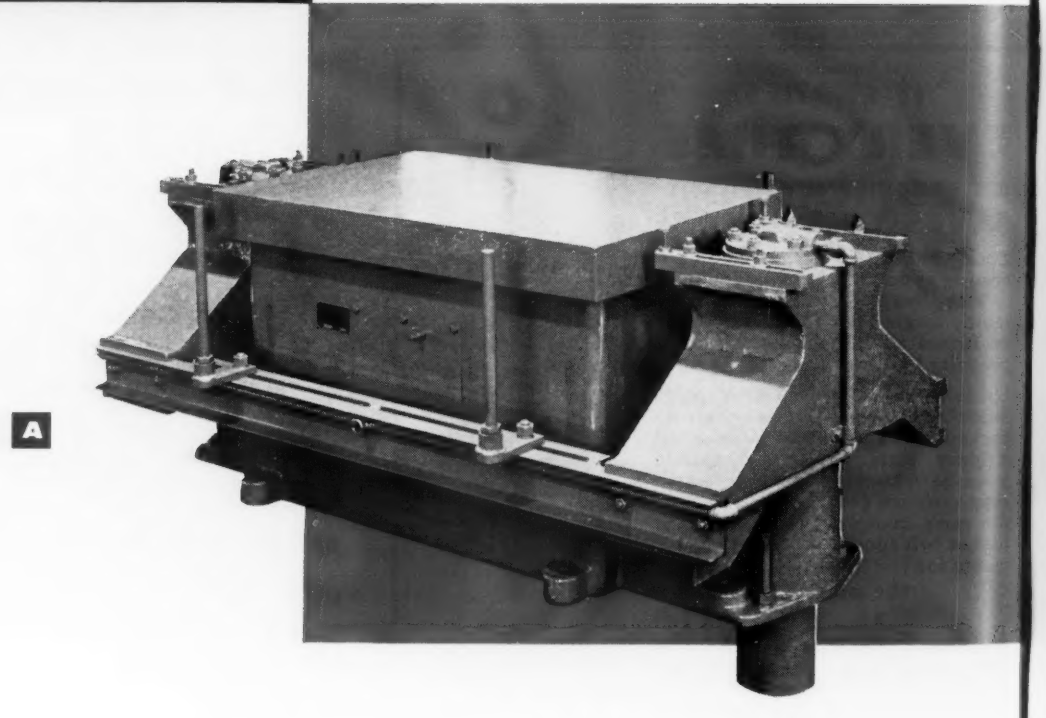
**Gentlemen: Please send me details and price information on**

☐ PEKAY MIXER-MULLER
☐ PEKAY M-T-MATIC ELEVATOR BUCKETS

(NAME)_____
(COMPANY)_____
(ST. & NO.)_____
(CITY)_____ (ZONE)____ (STATE)_____

# FIT THE JOLT

# TO THE JOB



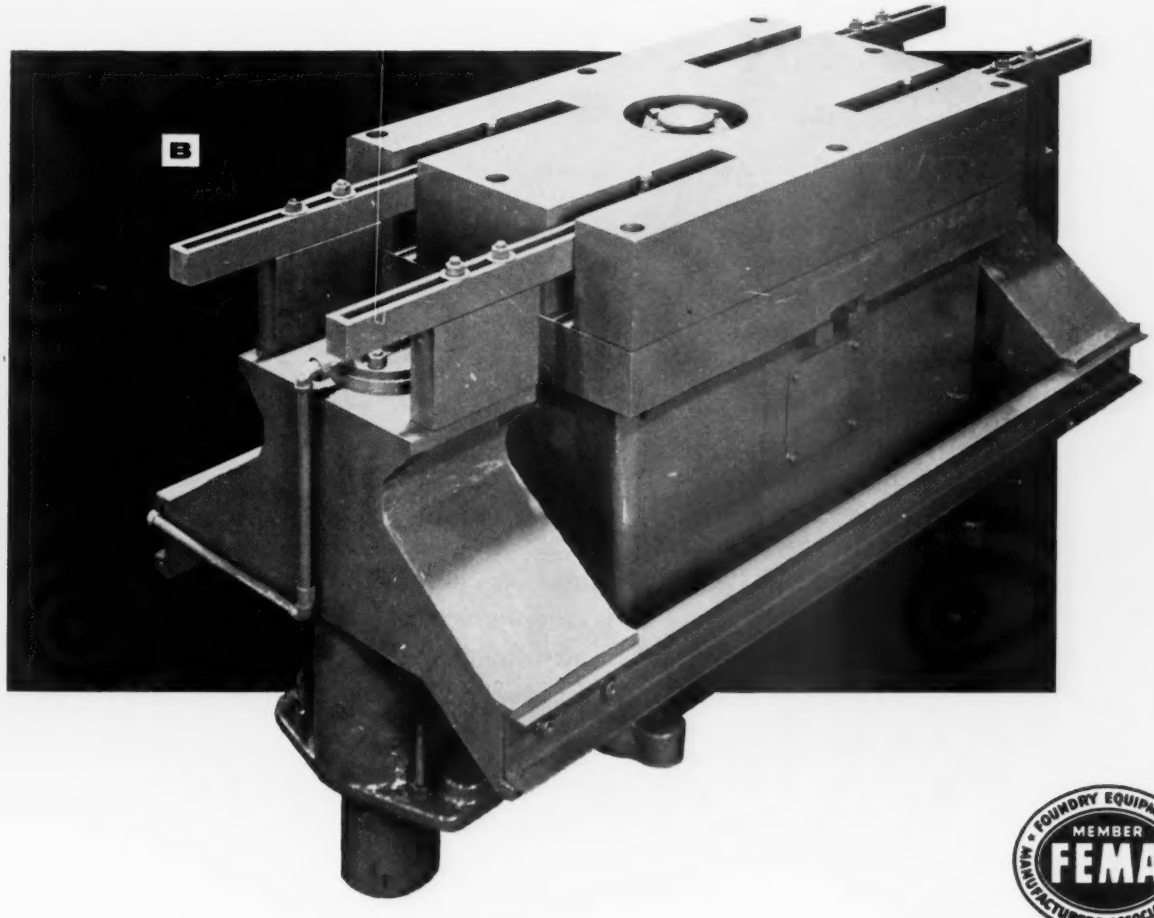
A

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

That's exactly what you can do if you specify a Herman Jolt Strip Molding Machine. Herman offers you 78 production models to choose from, each one designed to meet a specific foundry requirement.

The jolt strip machines pictured here, for example, are designed for short-run, jobbing-type work. These machines have 20 x 36 inch tables and 1700 pound lifting capacities. In order to handle varying flask sizes, they are equipped with adjustable stripping devices. The machine in illustration A has stripping pins. In illustration B the same machine is equipped with a pattern stool and adjustable stripping fingers.

Herman Jolt Strip Machines are available with lifting capacities ranging from 600 pounds, 10 x 15 inch table, to 73,000 pounds, 7 x 10 foot table. We'll be glad to provide more detailed information on these Herman machines, or have one of our engineers contact you.




FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

# HERMAN

**Best Known Name in Molding Machines**



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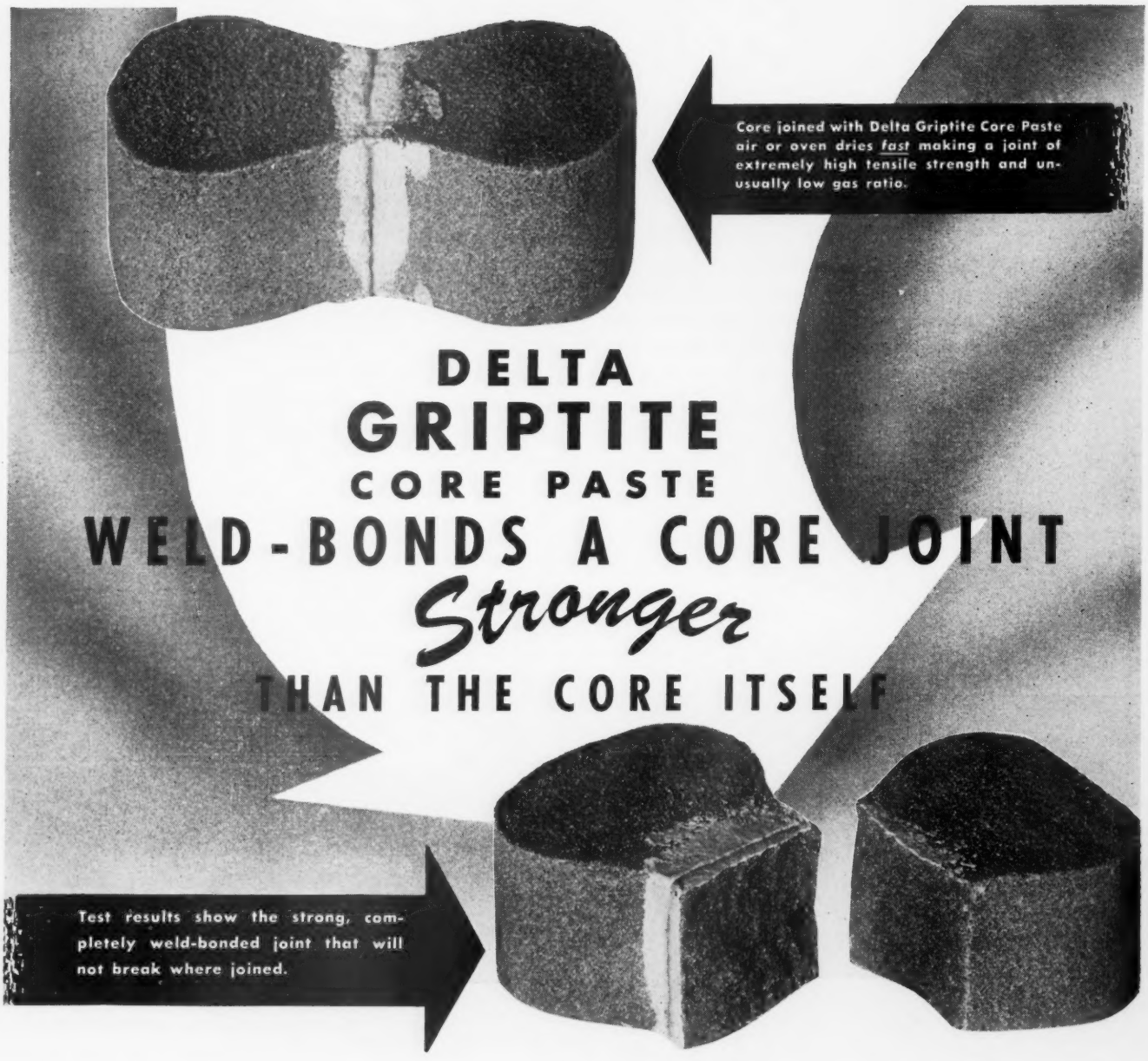

Core joined with Delta Griptite Core Paste air or oven dries fast making a joint of extremely high tensile strength and unusually low gas ratio.
DELTA
GRIPTITE
CORE PASTE
WELD-BONDS A CORE JOINT
Stronger
THAN THE CORE ITSELF
Test results show the strong, completely weld-bonded joint that will not break where joined.

New Delta Griptite Core Paste penetrates deep into core surfaces to produce a welded bond of sand many times *stronger* than the core itself. Cores joined with Delta Griptite Core Paste will not break or fracture at the joint.

Delta Griptite Core Paste has a low gas ratio which eliminates the possibility of paste blows. It contains no low fusion materials, is completely stable and is non-reactive with molten metals. It is easy to mix, air or oven dries quickly and, when dry, is resistant to moisture pickup.

Available in 100 lb. paper bags or 400 lb. (net) lined wood barrels.

*Working samples and complete literature on Delta Foundry Products will be sent to you on request for test purposes in your own foundry.*

DELTA

**DELTA OIL PRODUCTS CO.**

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

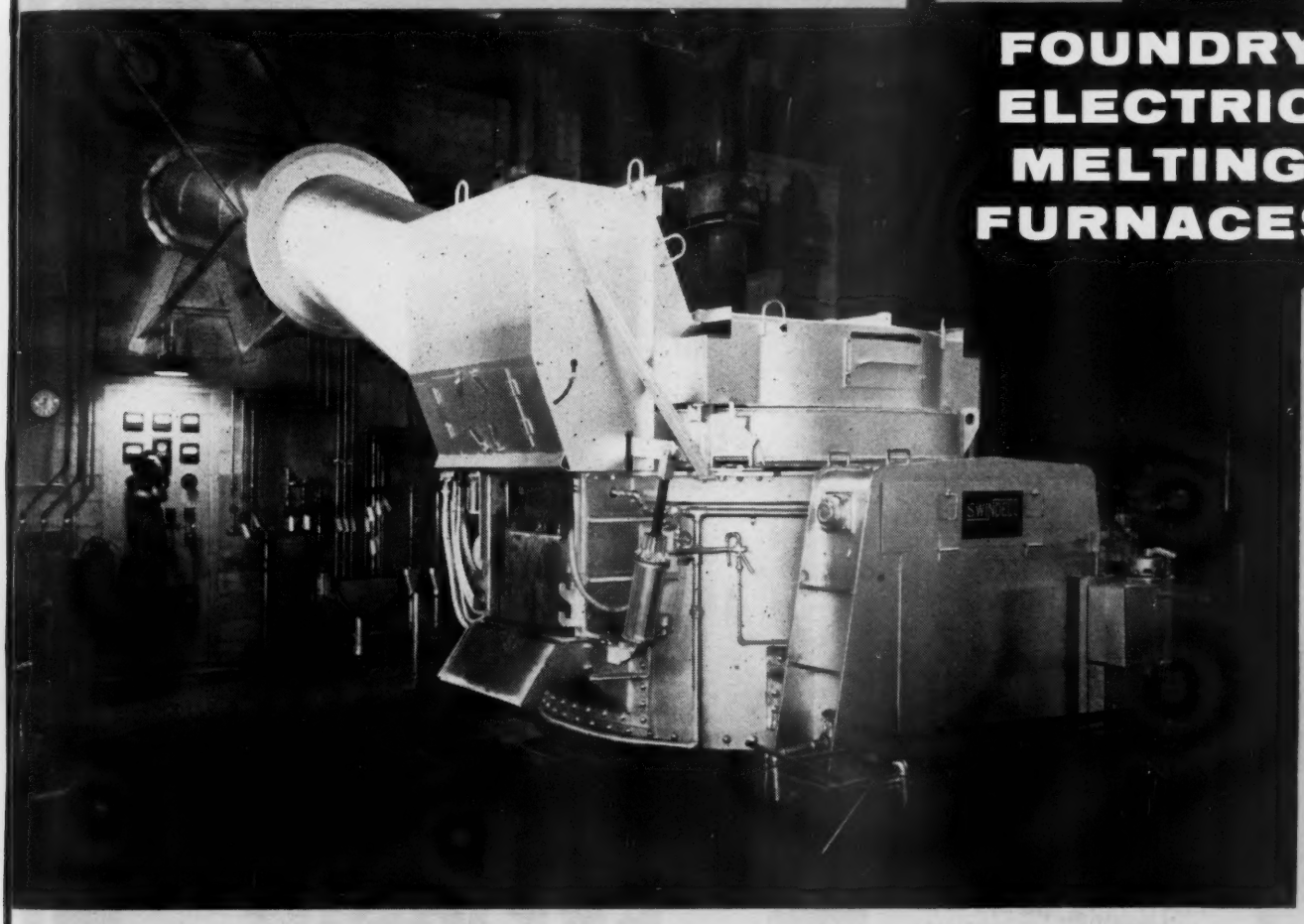
**MILWAUKEE 9, WISCONSIN**

# *Chosen by* AMERICAN HOIST & DERRICK CO.

LEADING CRANE MANUFACTURERS

*for their entry into foundry electric furnace melting*

## SWINDELL FOUNDRY ELECTRIC MELTING FURNACES



## SWINDELL *Electrode Hoist Mechanism*

**—ANOTHER SWINDELL QUALITY FEATURE**

SWINDELL Electric Melting Furnaces for foundry service provide the productivity, low maintenance and long useful life built-in by genuine steel mill design and construction by steel mill melting furnace specialists. Write for a consultation.

When the leading crane manufacturer chooses SWINDELL, you can be sure the electrode hoist has passed with honors! Typically Swindell in quality, the hoist employs a motor reducer with integral cable drum, mounted close to the work for shortest cable length. This results in fast, accurate response, eliminating long-cable stretch, elaborate equalizer systems, and costly foundation cable channels. There is no hydraulic system to cause leak hazards or high maintenance—the Swindell hoist is electro-mechanical throughout, providing positive, split-second regulation of electrodes at all times. ● Let us detail the facts for you!

WRITE for your copy of the latest Swindell Electric Melting Furnace Catalog—sent promptly on request.

**SWINDELL-DRESSLER *Corporation***

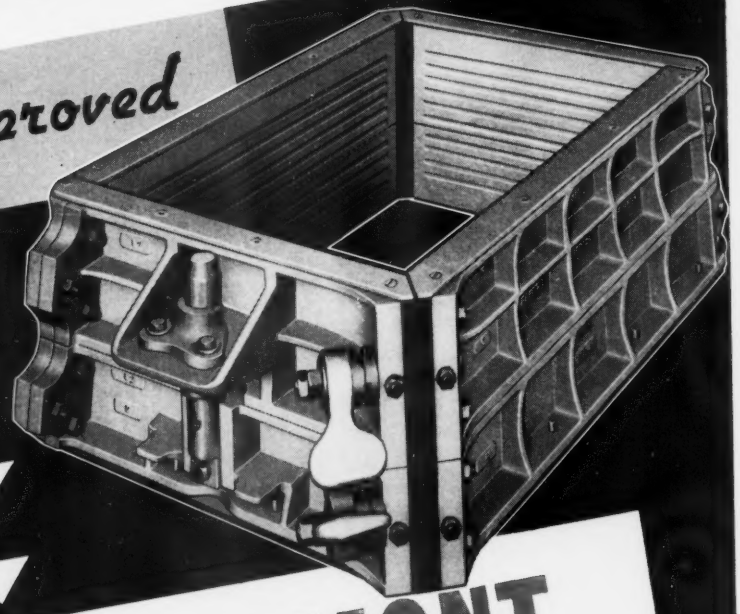
DESIGNERS AND BUILDERS OF MODERN INDUSTRIAL FURNACES

PITTSBURGH 30, PA.

*Circle 599 on Inquiry Card—Page 217*

# The FLASK with the NEW STRENGTH BUILT-IN

*the new improved*



■ New two-piece male and female stop, inserted above and below the stud bolt, result in additional corner strength. Corner gaps completely closed by long-life, easily replaceable, live rubber corner inserts which prevent sand from lodging in corners.

■ Made of magnesium, which has twice the tensile strength of aluminum, with cams of hardened steel forgings, the Spread-lock really resists wear . . . assures long service.

■ Furthermore, magnesium weighs ⅓ less than aluminum, so they are light in weight, easier to handle.

■ The accurately machined inside surfaces and flanges, and steel-faced top and bottom flanges assure most exacting work.

*Write today for free literature and prices.*

## FREMONT SPREADLOCK FLASK

NO OTHER FLASK GIVES YOU ALL THESE ADVANTAGES!

*The Fremont* FLASK Co.
FREMONT, OHIO

# FLOWABILITY WITH DIXIE BOND

Pure
Southern Bentonite

## SIX WAYS BETTER

1. Dixie Bond sand flows to give maximum mold hardness and improved casting finish.
2. Dixie Bond sand flows with reduced plugging of elevators and belts.
3. Dixie Bond sand flows with reduced hang-ups in the molders' hoppers.
4. Dixie Bond Sand flows at the shake-out with less lumping, easier knock-out, reduced flask maintenance and fewer broken castings.
5. Dixie Bond flows for accurate weighing and reduced hang-up in storage hoppers and feeders, together with improved pneumatic handling.
6. Dixie Bond slurries flow because of minimum viscosity with maximum solids content.

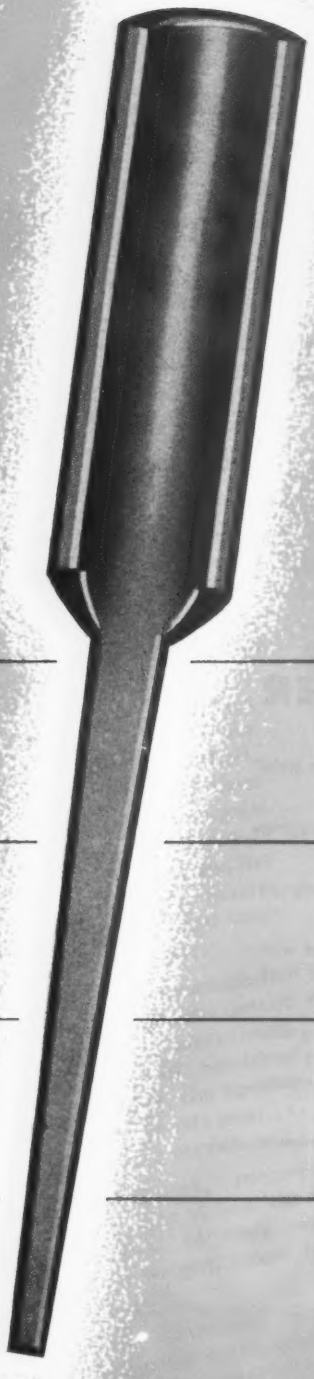
International MINERALS & CHEMICALS

**EASTERN CLAY** PRODUCTS DEPT. • INTERNATIONAL MINERALS & CHEMICAL CORPORATION • 20 NORTH WACKER DRIVE • CHICAGO 6

Dixie Bond • Black Hills Bentonite • Revivo Bond • Plasti-Bond • Revivo Core Paste • Cupolinor • Cupoline • Taccone Molding Machines



*Circle 601 on Inquiry Card—Page 217*



# FUSET* CHILL NAILS

- ORIGINAL DESIGN
- MASS PLUS SURFACE
- IMMEDIATE CHILLING AND FUSION
- IMPROVES QUALITY
- LOWERS COSTS

*PATENT NOS. 2,731,688, 523,412, 540,053, 1,710,268, 540,888. OTHERS PENDING.

*TRADE MARKS REGISTERED

CANTON CHAPLET AND CHILL
DIVISION
THE W. L. JENKINS CO.
1445 WHIPPLE RD. S. W.
CANTON, OHIO

# Superior Performance through Superior Design!

First open channel chill embodying scientific principles of mass plus surface. Patented design provides more chill and fusion area.

Unique combination of two heat-conduction principles permits higher degree of chilling efficiency than ever before obtainable.

Balanced arrangement of maximum surface with correct cross section thickness transfers heat faster and enables finest possible fusion!

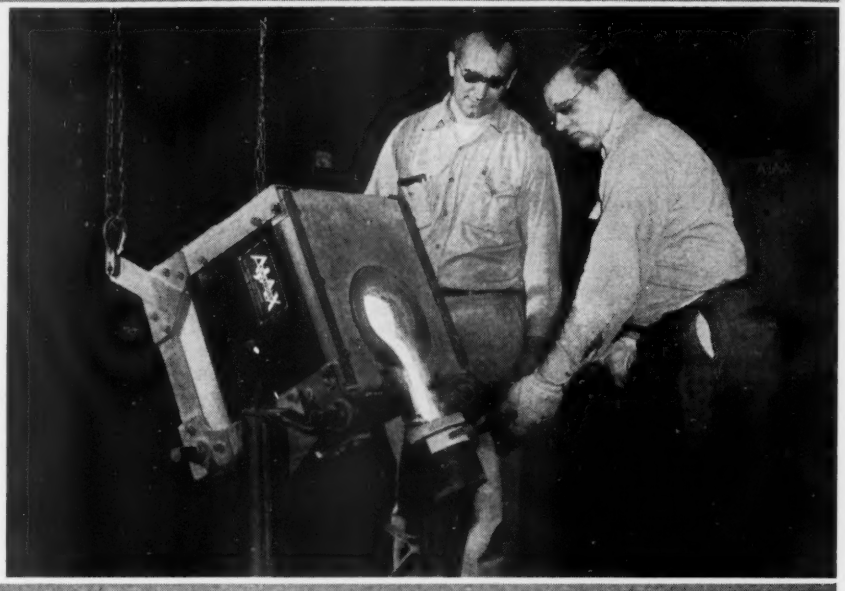
Exclusive channel design permits maximum parent metal fill-in around chill — increases casting strength — allows better control of shrinkage and solidification.

Less bulk lowers shipping, coppering, storage, plant handling and labor expenses. Fuset efficiency reduces scrap, welding and finishing costs.

***WRITE TODAY FOR PRICES AND SAMPLES***

FUSET® CHILL NAILS ARE MADE IN A WIDE RANGE OF SIZES. EXCLUSIVE FEATURES ARE ALSO AVAILABLE IN FUSERT® CHILLS FOR LIGHT OR HEAVY SECTIONS AND FUSPIDER® CHILLS FOR A LARGE VARIETY OF APPLICATIONS.

# how Ajax induction melting meets investment casting requirements



*. . . at Precision Metalsmiths, Inc.*

The special melting requirements of precision investment casting are an old story to Precision Metalsmiths, Inc., Cleveland, Ohio. This one foundry melts ninety-two different ferrous and nonferrous alloys . . . often in small quantities. Many of these alloys require unusual protection from contamination during melting—and substantially all are made to extremely close analyses. Carbon content in some must be kept *below .04%*.

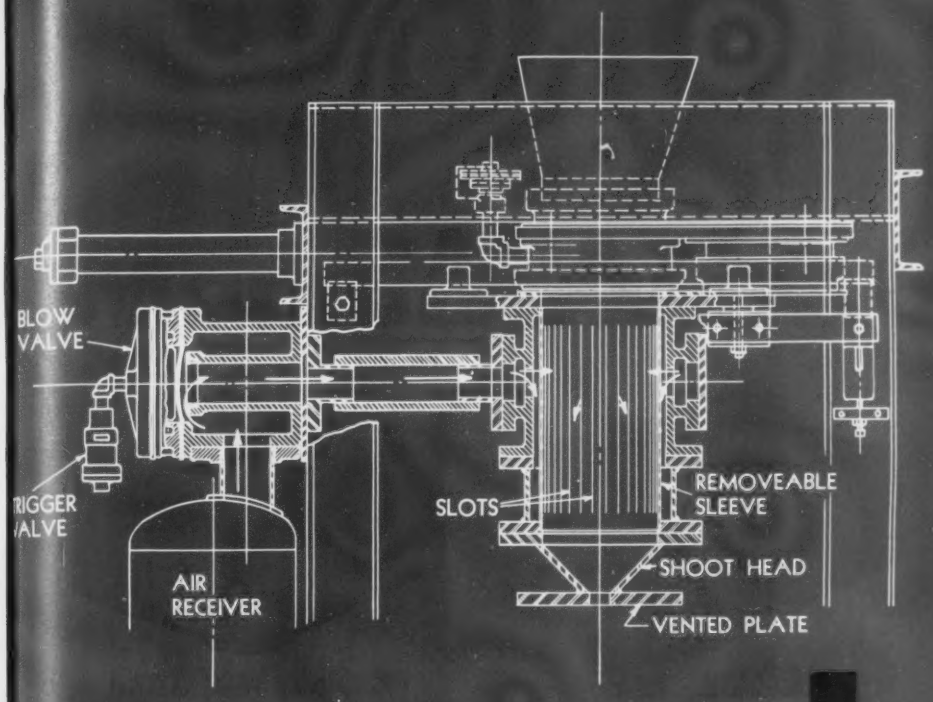
Only an Ajax-Northrup converter-powered induction melting unit could meet the requirements of versatility, purity, and economy so well. That's why four Ajax units now satisfy all the company's production needs. Three 17 pound capacity portable furnaces are each powered by 20 kw Ajax-Northrup spark gap converters; and the fourth, a fifty pound capacity tilting furnace, is powered by a 40 kw Ajax-Northrup converter.

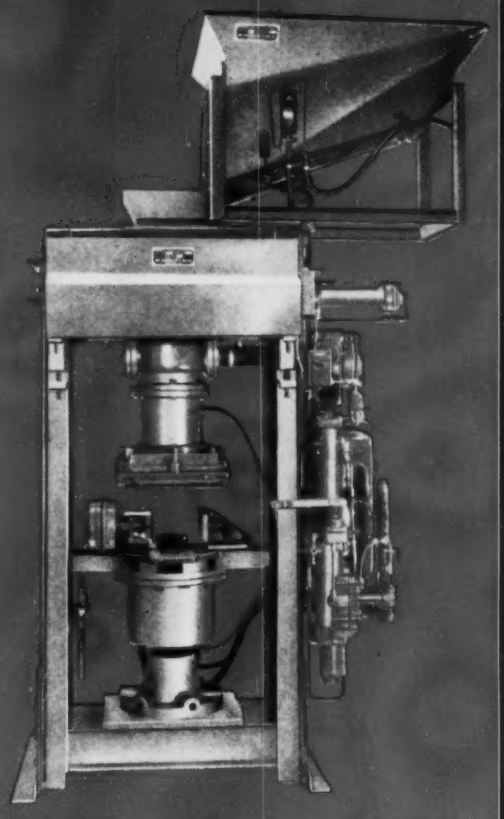
Precision Metalsmiths standardized on Ajax because Ajax-Northrup units cost far less to operate and maintain in operation. They're ruggedly constructed to take the toughest kind of service in stride. Normal converter maintenance is limited to cleaning the gap chamber and inspection at three month intervals. For additional details, write Ajax Electrothermic Corp., Trenton 5, New Jersey, requesting Bulletins 14-B and 27-B.

*Associated Companies:* Ajax Electric Company—Ajax Electric Furnace Co.—Ajax Engineering Corp.

AJAX NORTHRUP *SINCE 1916*

**INDUCTION HEATING-MELTING**



**#101-EO DEMMLER CORE BLOWING MACHINE**

This machine may be used for shooting cores by substituting a shoot head for the standard blow plate.

Best quality cores are often produced by the time tested blowing method, and when it is preferred to use the machine as a blower the change can be made quickly and conveniently.

These are the same type machines as the successful Demmler mold blowers which have been breaking molding records for the past three years.

Yes, you can have a machine that gives you complete flexibility, to blow or shoot as you choose. Write us for complete data on this Demmler 101-E machine.

# DEMMLER

**FIRST NAME IN CORE BLOWERS**

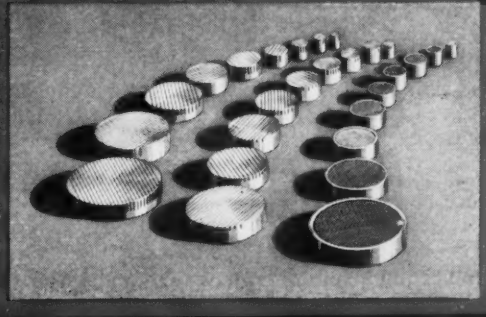
# NOW ONE MACHINE DOES BOTH .....BLOWS OR SHOOTS CORES

**RECISION CORE BOX VENTS**

mmler is by-far your best rce for precision core box ts, manufactured by specialists o pioneered in the core blower dustry. Many sizes, slot widths d screen meshes are available brass and steel core box vents.

**NEW HL 150 Mesh Vents**

A new general purpose vent which practically eliminates the cleaning coarser screens demand. Write for literature on Demmler vents.



**WM. DEMMLER & BROS.**

**KEWANEE, ILLINOIS**

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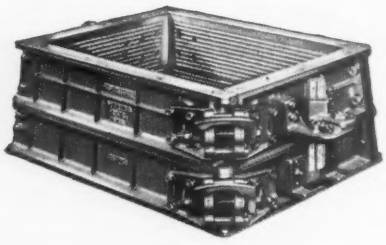
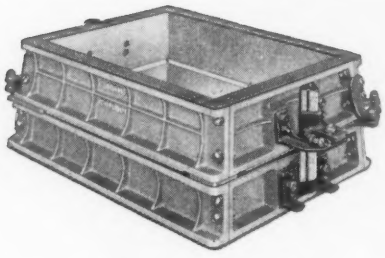
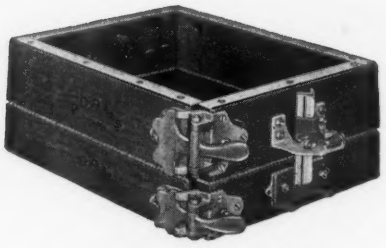
# ADAMS . . . . .



Aluminum Easy-Off Flask

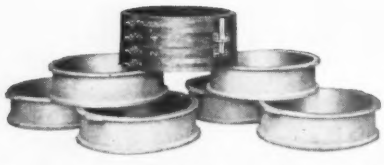


Aluminum Slip Flask

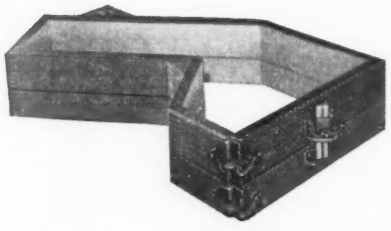


Cherry Snap Flask, tapered

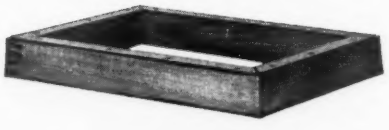
# Flask Equipment to meet



Cherry Snap Flask, Round with Cast Iron or Aluminum Jackets



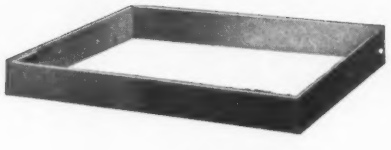
Cherry Snap Flask, Special Shape



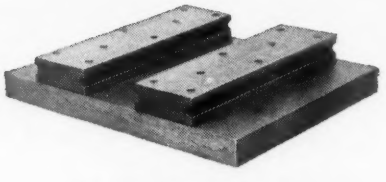
Cherry Upset

# in practically all methods

Steel Jacket



Steel Band



Cherry Presser Board

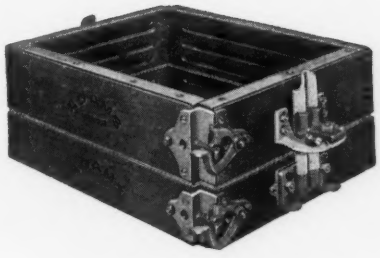
**THE MOST COMPLETE LINE OF FLASK EQUIPMENT**

Let Adams help you analyze your flask equipment problems. Write today for further information.

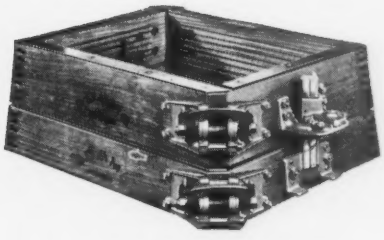
Pin and ear arrangement available to interchange with present Pattern Plate guides.

Handles and trunnions are available where required.

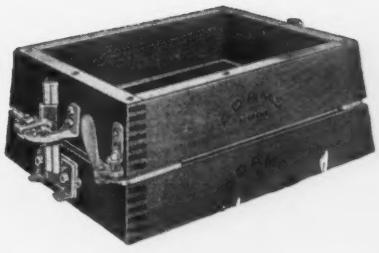
# Manufacturers of



Cherry Snap Flask, Straight

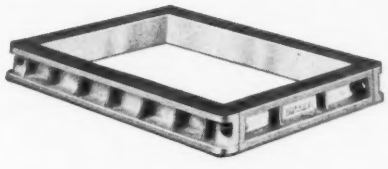


Cherry Easy-Off Flask

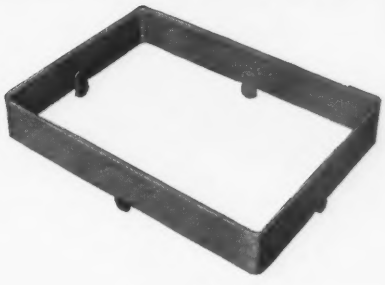


Cherry Slip Flask

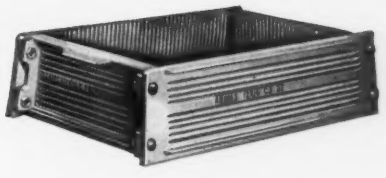
# your requirements



Aluminum Upset

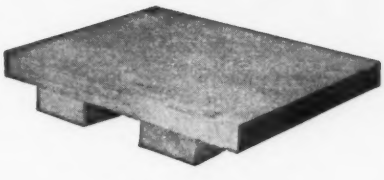


Steel Upset



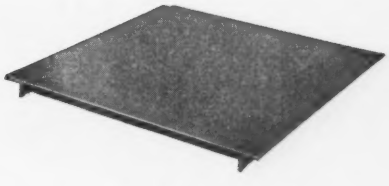
Cast Iron or Aluminum Jacket

# of production.



Wood Bottom Board

No. 1 Steel Bottom Plate



No. 2 Steel Bottom Plate

# The ADAMS Company

ESTABLISHED 1883

MOLDING MACHINES and FLASK EQUIPMENT

**700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.**



*Circle 606 on Inquiry Card—Page 217*

**GIANT EARTHMOVER**—Construction equipment like this helps the nation meet the need for new super highways. Castings are vital in the manufacture of such equipment.

# TRULINE® HELPS PREVENT FOUNDRY ROADBLOCKS

Truline Binder is playing an important role in helping foundries meet the challenge of near capacity work loads.

In the core room, in the molds, in the cleaning room—every step of the way—Truline has proved its ability to increase efficiency, reduce man-hours per ton.

Among Truline's many advantages is its quick bake which permits you to almost double oven capacity. Add to that the fact that Truline produces strong cores with superior collapsibility and you see why so many foundries today rely on Truline to meet production schedules. For quick bake, less breakage, less repairs in the cleaning room, you can count on Truline. We'll be glad to discuss how Truline can help you. Write for information:

HERCULES

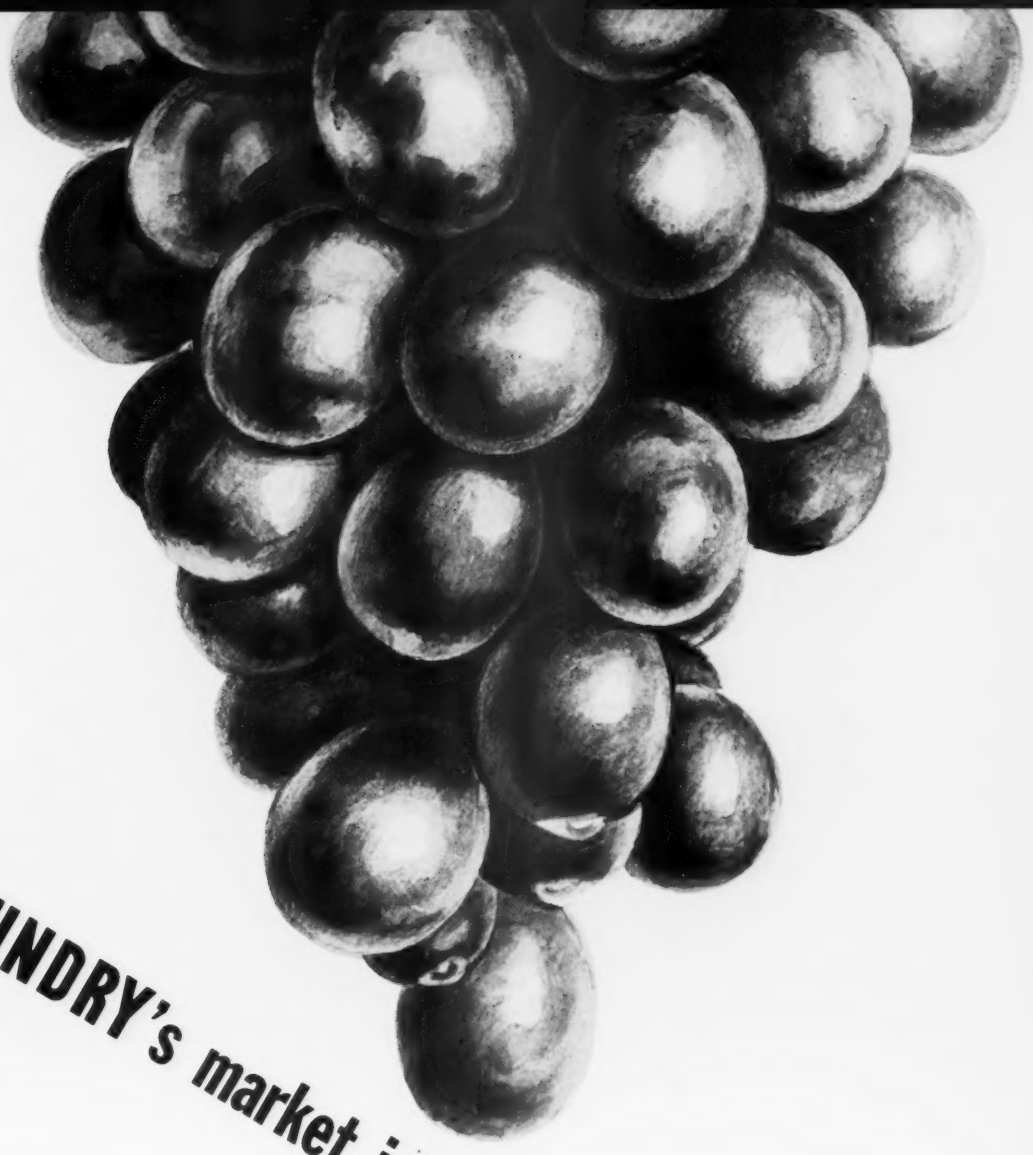
*Pine Chemicals Division, Naval Stores Department*

*HERCULES POWDER COMPANY*

INCORPORATED

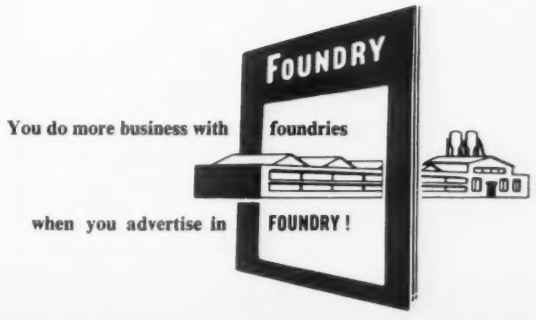
*920 King Street, Wilmington 99, Del.*

NF56-2



# FOUNDRY's market is ripe*

* **Buying action has to be fast** in the foundry industry where equipment wears out fast, creating one of the biggest replacement markets, per plant, of any industrial classification.
* **A $6 billion market**... FOUNDRY magazine opens doors ... parades your product advantages in front of over 66,000 key buying influences.
* **FOUNDRY reaches every foundry** employing over 20 and 85% of all others—over 5,700 plants which together produce 98% of all castings.
* **Foundrymen read FOUNDRY** from cover to cover. But that's only one part of FOUNDRY's complete Sales Development Service. Ask us for details.




a PENTON Publication / Penton Building, Cleveland 13, Ohio

**ALUMINIZED**
Protective Clothing

# Don't ROAST a good worker... put him in AO† ALUMINIZED CLOTHING

## Reflects 90% of Radiant Heat!

AO aluminized asbestos not only reflects 90% of the radiant heat but is 50% lighter than ordinary asbestos. No wonder it's more comfortable to wear for long periods! Yes, and it's more durable and flexible — with good abrasion resistance. AO aluminized duck has the same high radiant heat reflective quality as AO aluminized asbestos and is recommended for milder exposures where molten metal splash is not a factor. With both fabrics you get the advantage of AO skilled tailoring in a complete line of gloves, mittens, coats, cape sleeves and detachable bibs, pants, chaps, aprons, hoods, leggings and spats. Your nearest AO Safety Products Representative can supply you.

### Recommended Uses

For protection against high heat (including direct radiation), sparks and molten metal splashes on such operations as — Open hearth, blast furnace and electric furnace tapping — Pushing of coke ovens — Cupola and ladle pouring — Exposures at glass tanks (molten glass) — Cutting, scarfing, any gas burning of metals.

142RA APRON

208BRA CAPE SLEEVE WITH DETACHABLE BIB

7X160RA LEGGING AND 7X161RA SPAT

American Optical COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • *Branches in Principal Cities*

# Ingersoll-Rand does

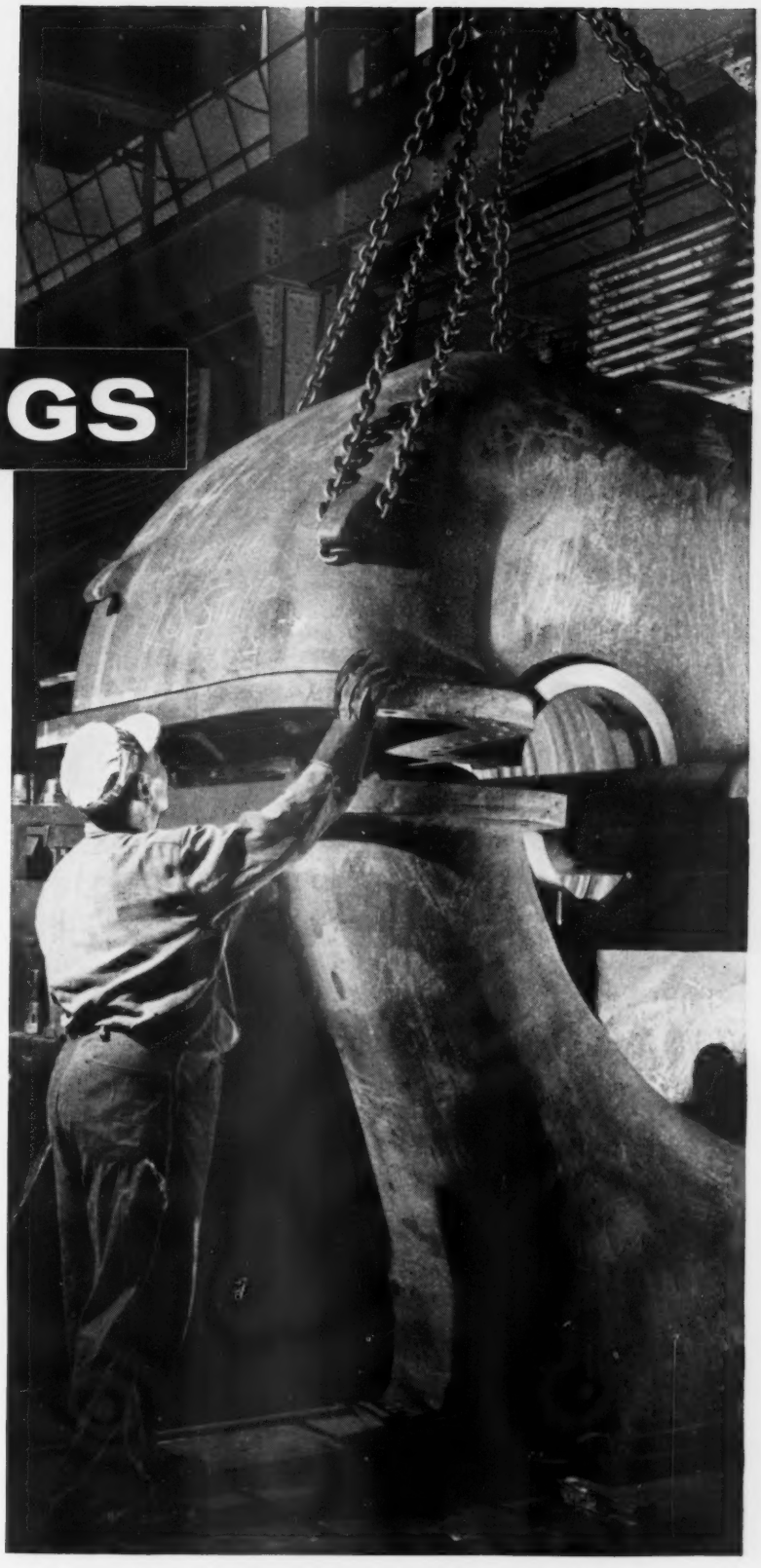
# BIG THINGS

# with Hanna pig iron

Castings made in the Ingersoll-Rand foundries vary in weight from a few ounces to 30 tons. But one thing that never varies is the quality of I-R castings. For over 30 years, Hanna Furnace has been furnishing Ingersoll-Rand with ever-increasing amounts of pig iron that has the high metallurgical qualities and exact analyses required for its engineering grades of iron.

Hanna's wide product range includes the Hanna 38-lb. pig, the foundryman's favorite standard, in all grades, silvery and HannaTite, our special controlled, close-grain iron. Also the HannaTen ingot, a 10-pounder with finer grain structure and no free carbon pockets. The HannaTen also is available in all grades, silvery and HannaTite.

Our customers know that Hanna and its representatives are eager to be of service to them.



Turbine castings, totalling 55 tons, being checked in a test assembly after final machining at the Ingersoll-Rand plant at Phillipsburg, N.J.

HANNA
THE BEST KNOWN NAME IN IRON

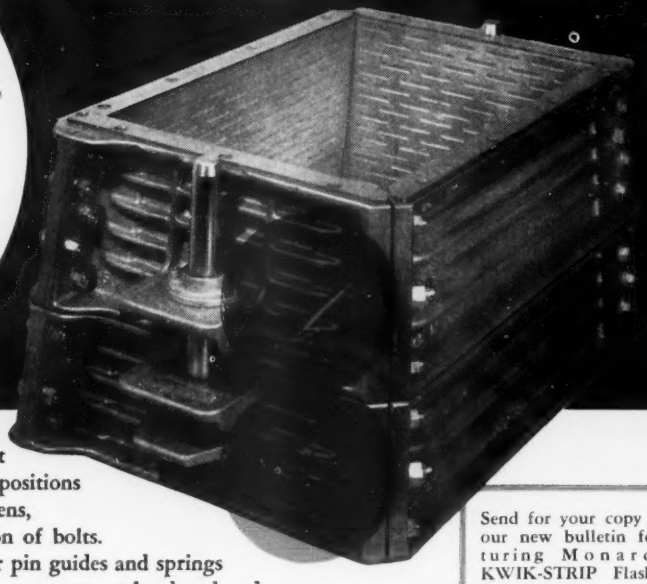
**THE HANNA FURNACE CORPORATION**
Buffalo • Detroit • New York • Philadelphia
Merchant Pig Iron Division of
NATIONAL STEEL CORPORATION


Circle 609 on Inquiry Card—Page 217

for MORE and BETTER MOLDS...

you can't beat the MONARCH KWIK-STRIP MECHANICAL CORNER FLASK

actually OPENS and CLOSES with FINGERTIP EASE



Locking handle bolts work directly in a straight line. Handles can be placed in any one of four positions (up and down position shown above). Flask opens, closes and locks with positive straight line action of bolts. Binding on working corner is eliminated. Corner pin guides and springs are completely sealed against sand. All working parts are case hardened and cadmium plated. Draw pins are hard chrome plated, centerless ground and polished for true diameter. Forged and plated guide bushings. Cold Rolled wear strips are standard on top of cope and bottom of drag. Wear strips on parting flanges optional. Sides are flat so flask can be set on edge without danger of tipping.

Send for your copy of our new bulletin featuring Monarch KWIK-STRIP Flasks, Jackets, Upsets and Accessories.

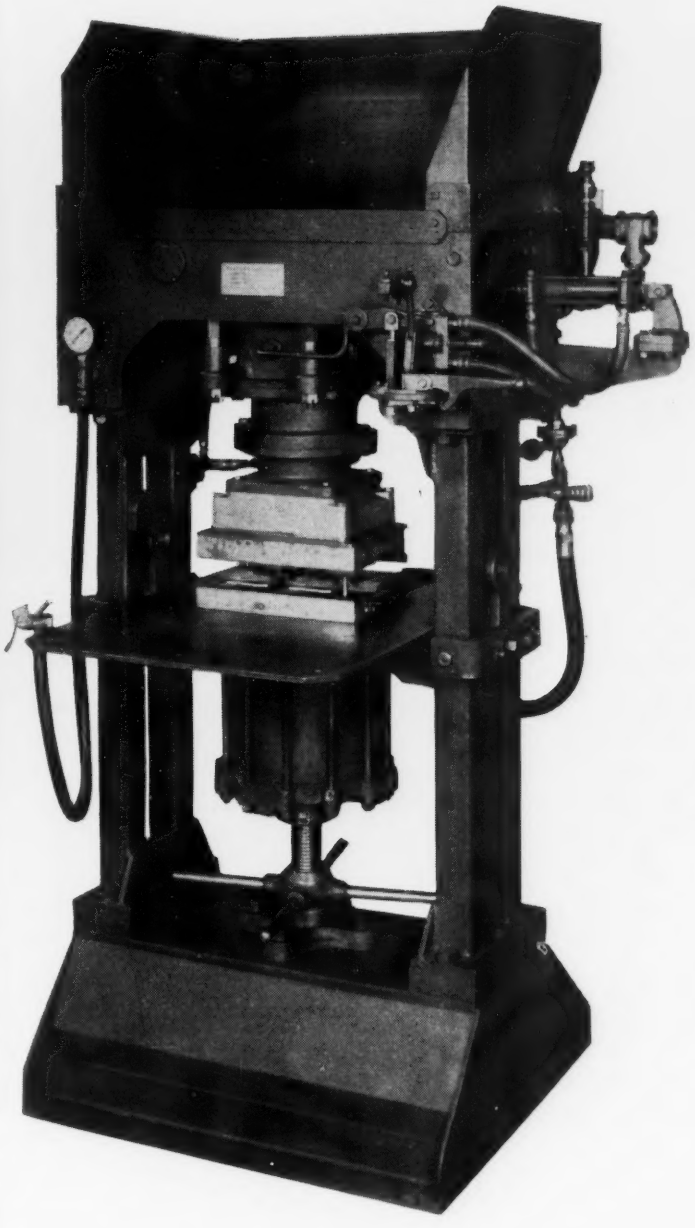
CONSTRUCTION: Precision built from cast aluminum or magnesium. Made with the most modern jigs and fixtures and machine tools to insure accuracy.

COPE AND DRAG SIZES: 12″ width x 4″ depth to 30″ width x 7″ depth; 12″ long x 4″ depth to 30″ long x 7″ depth, in increments of one inch. Upsets available in 1″ x 2″ depths. Standard 4° taper.

Cast aluminum or iron jackets available to fit all flask sizes listed above.

"Another Foundry product by"... NEWAYGO engineering company newaygo, michigan

# Redford No. 4-D DRAW TYPE CORE BLOWER



Designed primarily to fill the need for a fast and flexible draw type machine to handle work from a few ounces to 10 lbs., the Redford #4-D can be quickly adjusted to accommodate core boxes not requiring the draw feature, or can be equipped with a clamp to handle vertically parted core boxes.

Rugged construction, simplicity of change-overs and a fast operating cycle make it suitable for either jobbing or high production work.

Exhaust air is utilized to thoroughly fluff the sand remaining in the sand magazine after each blow, thus reducing the possibility of cratering.

The stationary sand magazine and accurately guided draw table assure perfect drawing of the cores. Vibration of the core box is automatic.

Magazine heads normally furnished with the #2 Redford machine can be used with the #4-D Redford. Larger new type magazine heads especially suited for draw type work are also available as standard equipment.

Valves are designed to assure maximum safety. The operator must use both hands at the same time in order to clamp the core box.

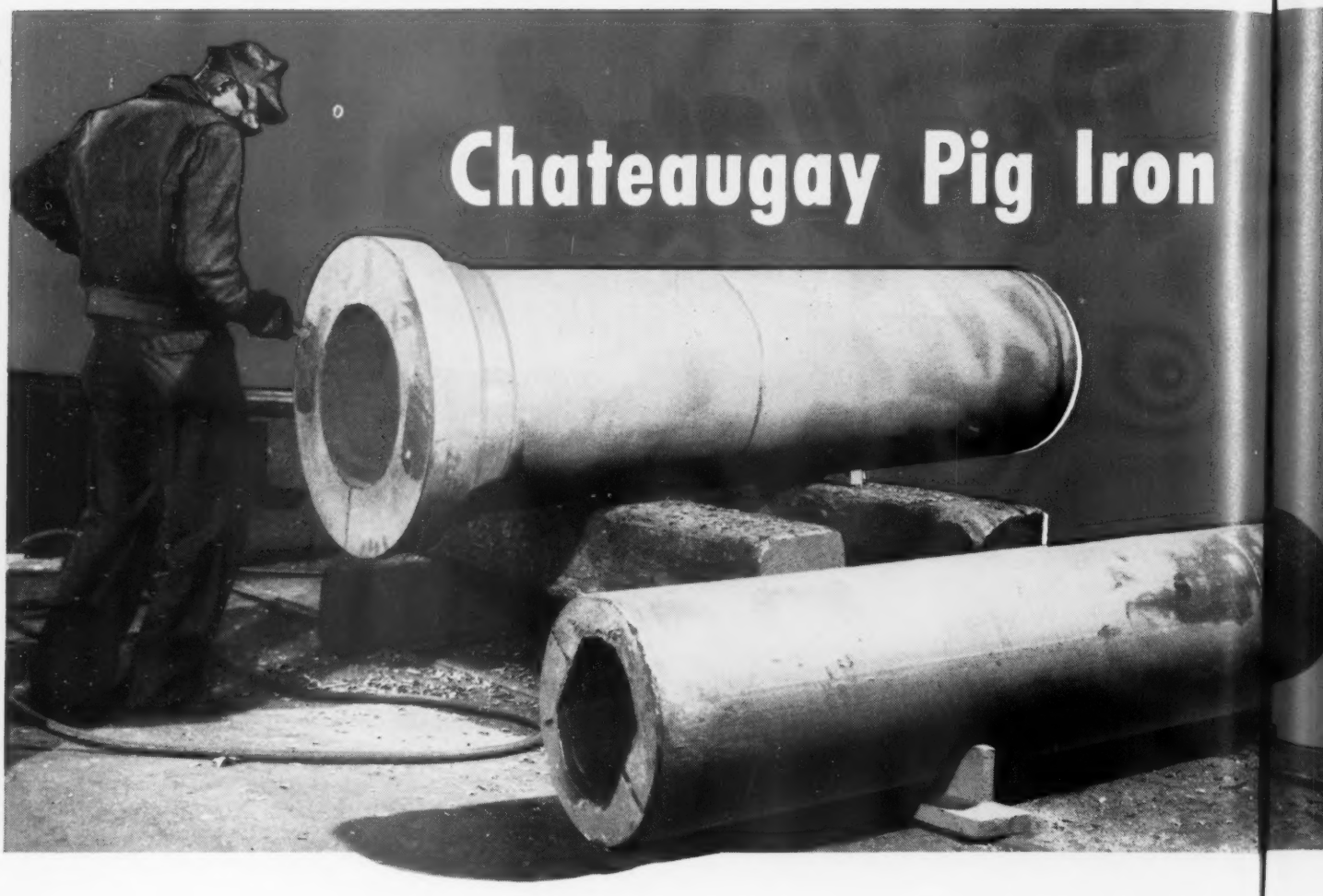
The Redford #4-D has been thoroughly proven in both small and large foundries. To get complete information write for Bulletin 4-D.

## Redford IRON & EQUIPMENT CO.

**20733 GLENDALE AVENUE • Phone KEnwood 1-8611 • DETROIT 23, MICHIGAN**

Circle 610 on Inquiry Card—Page 217






The Atlantic Foundry Co., of Akron, Ohio, is thoroughly sold on Chateaugay, Republic's Premium Pig Iron. Here is how Mr. Marcel Reymann, Vice President of Iron Foundry Operations, puts it:

"We have a job in our shop right now that I don't think could be done economically without Chateaugay. It's a ram and cylinder casting for a hydraulic press used in making plywood. Up until a few months ago, we made these parts of cast steel to withstand the tremendous pressures required by the completed press. Now we're making them out of "GRA-STEEL", using Chateaugay, and passing on a 21% saving to our customer."

Mr. Reymann continues: "We've tried other types of iron over the years and have settled on Chateaugay as a good solid, dependable iron. Much of our success in producing consistent quality castings can be attributed to the year-in, year-out uniform chemistry of Chateaugay, with each carload being as good as the last."

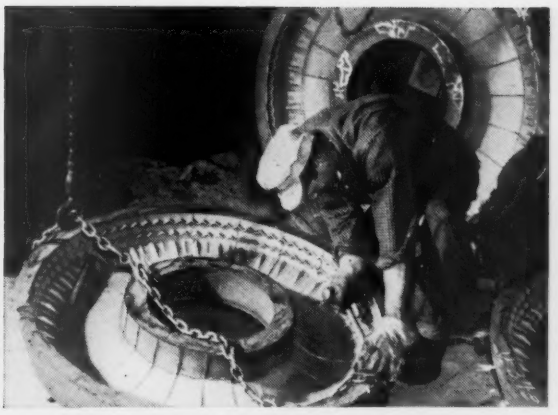
Why not check your own production in the light of these advantages? Or better yet, mail the coupon to secure the services of a Republic Pig Iron Metallurgist. He will be glad to demonstrate how you can benefit by using Chateaugay, the low-phosphorous, copper-free pig iron.

# REPUBLIC

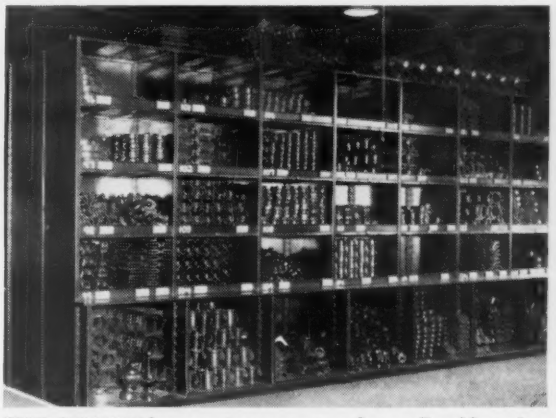
REPUBLIC STEEL

*World's Widest Range of Standard Steels*

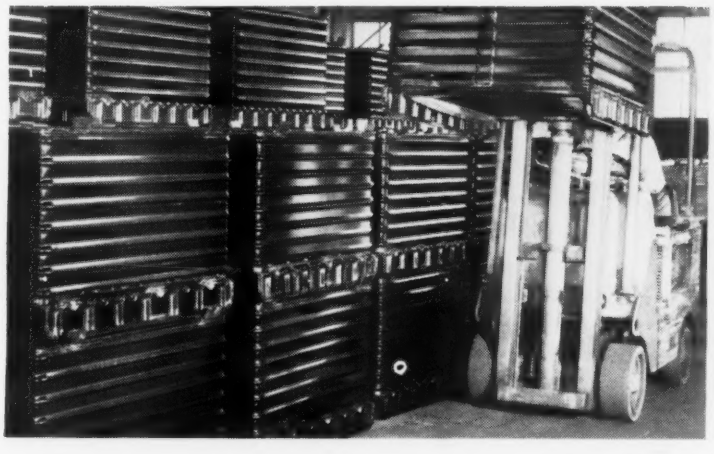
# permits foundry to pass on 21% savings to customer



**LONG-TERM SAVINGS** are yours when you use Republic Chain Products for your heavy-duty handling operations. Not subject to kinking or fraying, chain delivers long service with complete safety. Republic can furnish the proper type and accessories for all applications in alloy, high carbon or low carbon steel, and wrought iron. Send coupon for data.



**TIME SAVINGS** in your store room can be realized by using Republic Wedge-Lock Steel Shelving, especially designed for high stacking of great weights. Joints actually grow tighter and stronger as stored weight increases. Result is orderly stocking of products or supplies. Location of needed items is easy; time spent taking inventory is minimized.



**GAIN SAVINGS IN SPACE** for increased production or improved materials movement by using Republic Materials Handling Equipment. Complete line includes all types of steel boxes, skids, pallets and stacking racks. All units are ruggedly constructed to assure long, efficient service at lowest per-year cost. For illustrated literature, clip and mail coupon, today.

**STEEL**

*and Steel Products*

**REPUBLIC STEEL CORPORATION**
**Dept. C-1534**
**3132 East 45th Street, Cleveland 27, Ohio**

☐ Please have a Pig Iron Metallurgist call.

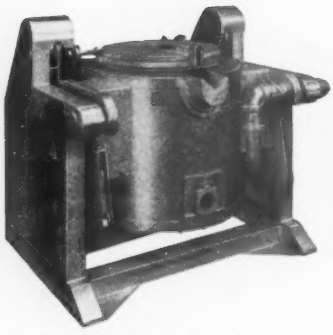
I am interested in more information on:
☐ Chain Products ☐ Steel Shelving
☐ Materials Handling Equipment

Name_____

Company_____

Address_____

City_____ Zone____ State_____



Lindberg-Fisher type MNP nose-pour tilting crucible furnace. Pouring lip is located in the axis of tilting providing a constant pouring arc regardless of degree of furnace tilt. Capacities up to #800 crucible with brass, up to #1000 crucible with aluminum. Oil or gas fired. Described in Bulletin 57-A.

Lindberg-Fisher Electric Resistance Melting and Holding Furnace equipped with heavy duty resistance elements which give uniform distribution of heat, insuring long element and pot life. Capacities 250 to #1000 crucible.

# For Non-Ferrous Metals

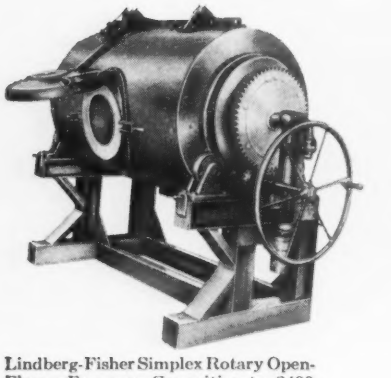
## A complete line of

**LINDBERG FISHER**

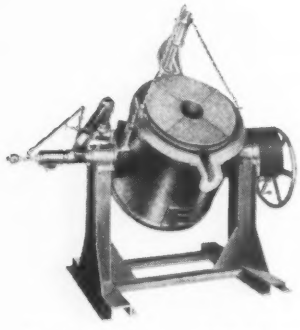
# MELTING AND HOLDING FURNACES

For Melting Aluminum • brass • yellow brass bronze • copper • copper nickel alloys • lead magnesium • nickel • tin • zinc.

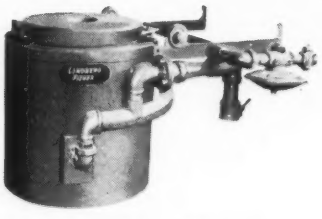
Because Lindberg-Fisher builds *all* kinds of melting equipment . . . gas . . . oil . . . electric . . . induction, and Carbon arc . . . L-F engineers are able to recommend, without prejudice, the proper type of furnace for *your* particular melting requirements.



Lindberg-Fisher Simplex Rotary Open-Flame Furnace. Capacities to 2400 lbs. aluminum. 6000 lbs. brass. Oil or gas fired. Described in Bulletin 29-A.



Lindberg-Fisher type BB1 Hand-Tilt Crucible Furnace. Tilting mechanism consists of a hand wheel, driven through machined worm gear and pinion reducing gears. Capacities 50 to #400 crucible. Oil or gas fired. Described in Bulletin 400.



Lindberg-Fisher type SF stationary crucible furnace features rapid melting and is recommended for general foundry casting work. Capacities 30 to #400 crucible. Oil or gas fired. Described in Bulletin 301.

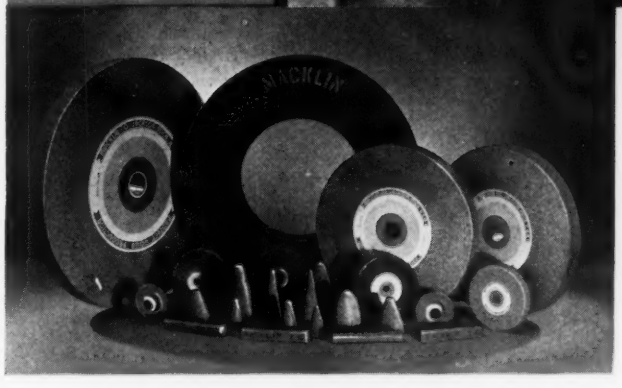
**Melting specialists for 25 years**

**Sales and service offices in principal cities**

**LINDBERG FISHER MELTING FURNACES**

A Division of Lindberg Engineering Company, 2453 West Hubbard Street • Chicago 12 • Illinois

MACKLIN




*Macklin manufactures a complete line of foundry wheels designed to "spark the production" in your cleaning room. Specify Macklin Wheels on your next job. A trial will convince you.*

## HOW TO SNAG MORE METAL PER HOUR AND GET LONGER WHEEL LIFE TOO!

● Today, every day, leading foundries are rating Macklin's new improved B-5 bond *tops* for snagging operations requiring fast, cool cutting and heavy stock removal. Jobs like grinding fins and gates from cast iron, annealed malleable, and steel castings.

***Results like these are the reason:***

| Product | | Wheel Life | Stock Ground Over the Wheel |
|---|---|---|---|
| Malleable Castings | MACKLIN | 24.1 hours | 17.04 tons |
| | Wheel B | 18 hours | 12.76 tons |
| 1030-1040 Steel Castings | MACKLIN | 57 hours | 35 tons |
| | Wheel C | 40 hours | 25 tons |

**IT TAKES LOTS OF RESEARCH AND TESTING** to develop any new Macklin Wheel. As much as is required for any other precision tool. And after the research, engineering and testing are complete, Macklin wheels are produced in one of the most modern plants in the industry, where you're assured of controlled formulation and accurate duplication.

**TRY A MACKLIN SNAGGING WHEEL ON YOUR JOB**
Your *Macklin Salesman or distributor* will be glad to demonstrate; show you how to save time . . . wheels . . . and dollars. You'll find him listed under "abrasives" or "grinding wheels" in the yellow pages of your directory. Or, if you prefer, write direct.

MACKLIN company
Dept. 22

JACKSON, MICHIGAN

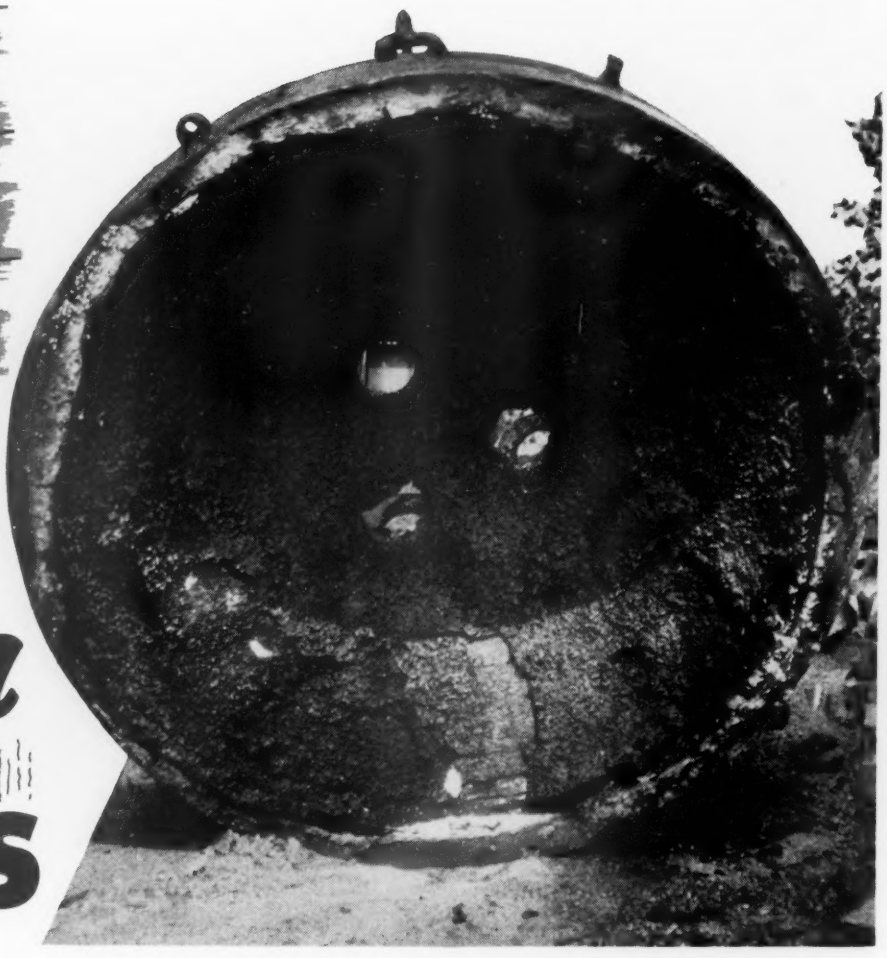
ROOF LIFE DATA FOR 1000-LB. DIRECT ARC ELECTRIC FURNACE

plastic firebrick roofs
33 heat average

mullite plastic
116 heat average

TAYCOR Ramming Mix
first roof—241 heats
second roof—254 heats

Roof of TAYCOR Ramming Mix for 1000-lb. direct arc furnace after 254th heat.



# Extra HEATS

## gained by TAYCOR roofs for direct arc furnace

The Fahralloy Company, Harvey, Illinois, operates a 1000-lb. basic direct arc furnace, melting 30-35 heats of heat and corrosion resistance alloys per week. Usual charge is 1500 lbs.

After changing from acid to basic furnace practice, tests were run with the following results: Silica roofs averaged 13 heats. Super-duty plastic firebrick roofs averaged 33 heats. Rammed roofs of competitive mullite plastic averaged 116 heats.

The first TAYCOR rammed roof set a record of 241 heats. The next TAYCOR roof jumped the record to 254 heats, some of them up to 3600-lb. triple sized ones.

Among the TAYCOR advantages reported by Fahralloy are:

**Longer roof life**
**No dripping**
**Longer sidewall life**
**Less slag**

Try TAYCOR Ramming Mix for your next direct arc roof. Let the Taylor field engineer in your area give you full details.

Exclusive Agents in Canada:
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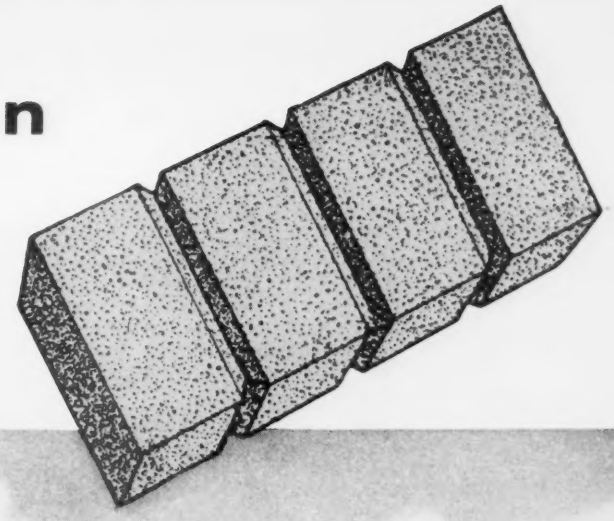

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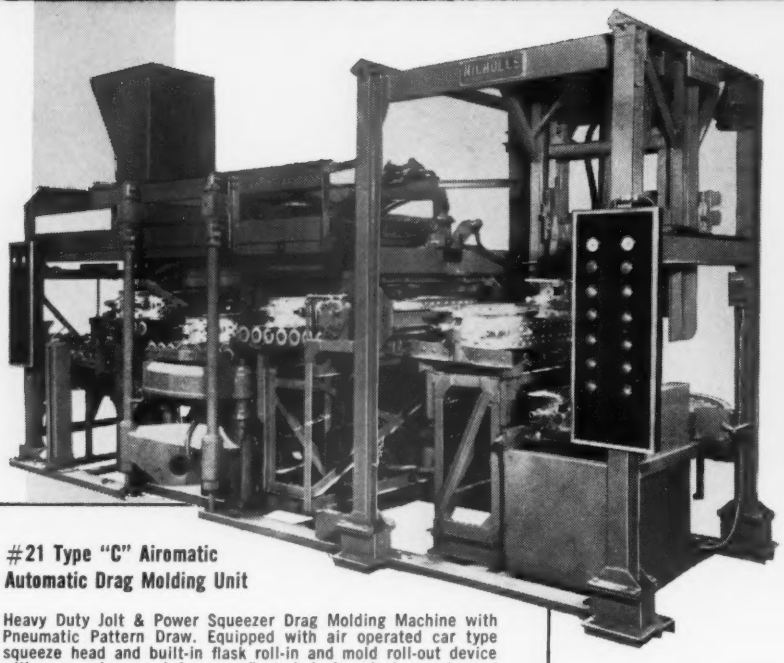

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# They've really got flexibility at Greenlee

**A CASE STUDY** at Greenlee Brothers foundry at Rockford, Illinois, reveals the methods this outstanding plant has used to attain top flexibility. In their machine tool foundry, as many as 120 patterns are handled each day and flexibility is essential. Two Motive Sandslingers, working back-to-back on the same track, ram all of the large pit and flask molds. Smaller, mounted and loose pattern work is rammed by a Stationary Sandslinger. No matter how many patterns are handled, there's never a slowdown for changes.

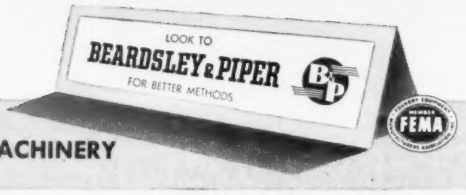
No other method of ramming equals the slinger for flexibility and there's a slinger designed for every job.

In Greenlee's production foundry, where a continuous, completely uniform supply of fully mulled sand is essential, the foundry depends on a Speedmullor for all molding sand for 23 floors. The complete story of Greenlee operations is told in November BETTER METHODS. If you haven't received your copy, send for one today.

Beardsley & Piper, Div. Pettibone Mulliken Corporation, 2424 N. Cicero Avenue, Chicago 39, Illinois.

**ONE '70' SPEEDMULLOR** uniformly prepares all of the molding sand for 23 floors. Bonding additions are only half those required with one of Greenlee's conventional mixers.

**TWO MOTIVE SANDSLINGERS** provide complete flexibility for Greenlee's large pit and flask work, while up to 70 different loose and mounted patterns are rammed by the Stationary Sandslinger each day.

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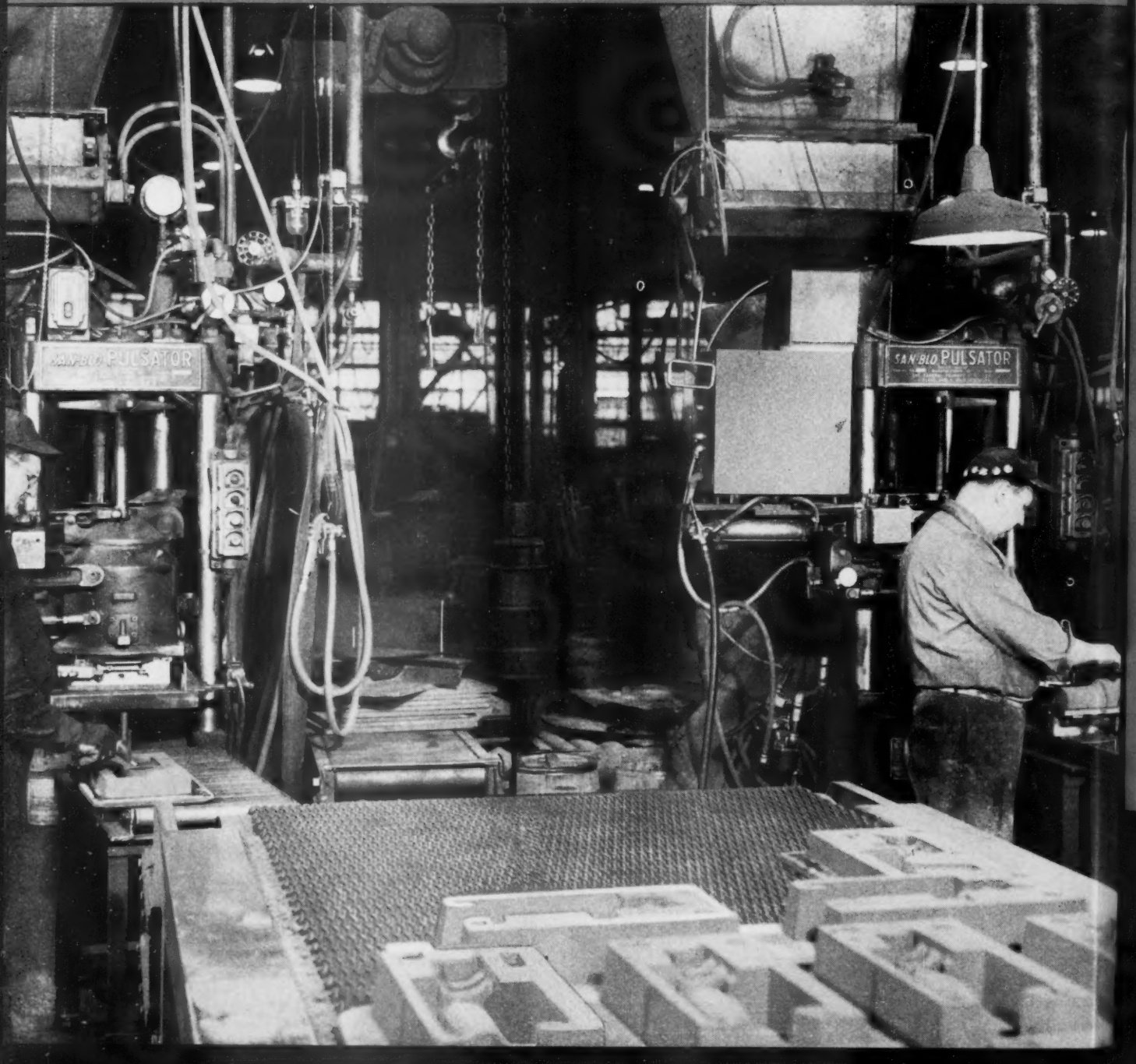

# IN REDUCING OUR CORE COSTS!"

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March 2, 1956

The Federal Foundry Supply Co.
San-Blo Division
4600 East 71st St.
Cleveland 5, Ohio

Attention: Mr. George E. Miller
Sales Manager

Dear Mr. Miller:

The use of SAN-BLO core blowers, in conjunction with a dielectric oven for subsequent and immediate baking of blown cores, is a natural and has worked wonders for us. The photograph of our installation, showing the arrangement of the two pieces of equipment, definitely points out the simplicity of the arrangement -- the oven just about keeping abreast of the core blowers, when operating at full capacity.

Incidently, this arrangement has enabled us to produce a 30# core at a rate increase from about 525 pieces per turn to 800 pieces--with less handling, less scrap, truer dimensions and in the mold in quicker time.

Needless to say, it simply means this: All that we did here was to allow the SAN-BLO machines to go full blast, eliminating delays due to handling and baking of the blown cores. Our two SAN-BLO units definitely have been a major factor in reducing our core costs, to the point where our only concern today is: "What else can we blow on our SAN-BLO's?"

Incidently, thanks to you and to your personnel for your part in our story.

Very truly yours,
LEBANON STEEL FOUNDRY
Philip A. Repino
Plant Engineer

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• SAN-BLO sales engineers will welcome an opportunity to analyze your requirements —so you can increase the efficiency of your core room. Please forward your request to our Cleveland Office.

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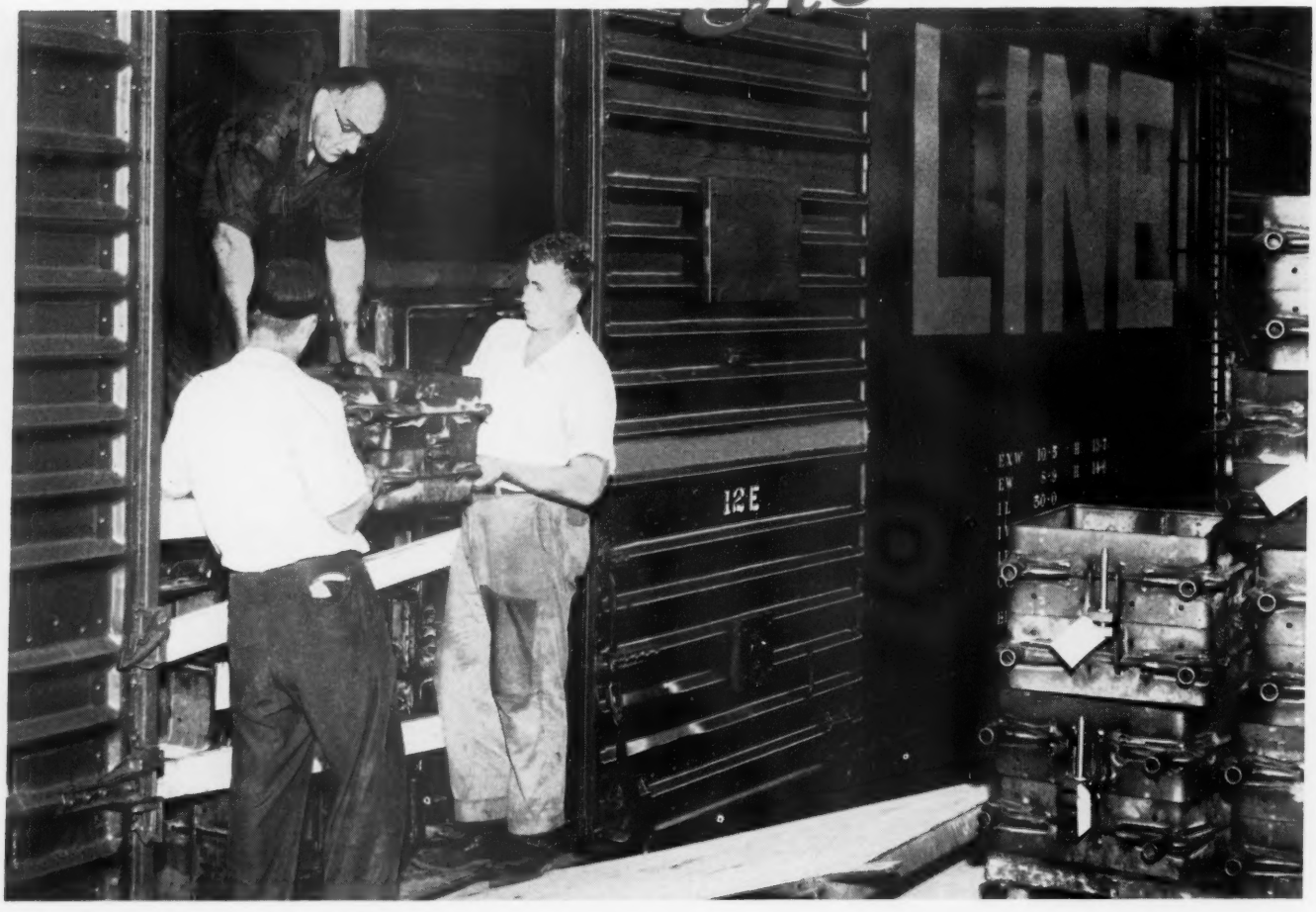


## Another Carload of Sterling Flasks Headed for California

It is an impressive fact, when foundries start using Sterling Rolled Steel Channel Flasks, they invariably come back for more Sterlings. The illustration above shows a freight car being loaded with a California shipment of 58,000 lbs. of Sterling Standard and Heavy Duty Flasks. For almost a half century, Sterling has built up an enviable reputation for retaining rigidity and accuracy under the toughest production schedules. Sterling Steel Flasks make the work go faster . . . save space, time and labor. For complete foundry flask service . . . consult Sterling. Write for catalog.

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Sand retaining flanges won't curl.

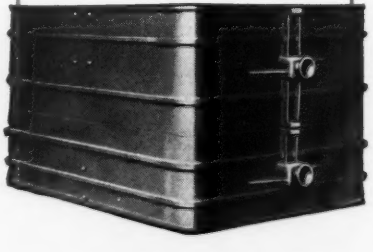
**SOCK 'EM**
Even 60,000 p.s.i. won't stop a Sterling.

**PILE 'EM ON**
You can stack-mold to a height of 10 sections, or more.

**WORK 'EM OVER**
Pour as often as you like.

**"SAND BAG" 'EM**
No soft spots under sand flange.

**SQUEEZE 'EM**
Sterlings love it!



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# The Customers' Needs

To provide information for its new marketing program, the Gray Iron Founders' Society has been conducting market research surveys among purchasing agents, product engineers and foundries. Some of the information developed by these studies already has been released and should prove quite interesting to all types of foundries producing castings for sale.

Returns from purchasing agents and product engineers have been most gratifying in both the number and excellence of replies. Sad to relate, returns from the questionnaire sent to gray iron foundries have been dragging. Could this indicate that buyers of castings are more interested in marketing problems than are the producers of that product?

What do purchasing agents really want from their suppliers of castings? Strange as it may seem, and perhaps contrary to the experience of many foundrymen, the vast majority put quality first, price a poor second and delivery a close third. They report machinability as the most important casting quality, with special dimensional accuracy, specified minimum strength and appearance rated equal in importance.

Practically all purchasing agents would prefer to buy castings direct from foundries rather than through manufacturers' agents. In the matter of pricing, 70 per cent are in favor of quotations based on price per piece rather than price per pound. They suggest that foundries give more attention to notifying customers when patterns need revisions, and they complain that too few suppliers of castings suggest changes in pattern equipment to lower casting cost. Along the same line, 92 per cent stated they would appreciate help in the design or redesign of products to achieve lower costs or improved quality.

Product engineers also would like to have more help from foundries, since 92 per cent also would welcome foundry assistance in design and redesign. This group most needs information on casting design, mechanical and physical properties, selection and specification of gray irons and heat treatment. It is interesting to note that 72 per cent of the designing engineers placed low costs as the most desirable characteristic of gray iron castings, and this advantage was followed closely by ability to cast in complex shapes and machinability. Evidently design engineers are being neglected by salesmen, since 64 per cent reported that they had not been called upon by a representative of a gray iron foundry during the previous three months.

The Gray Iron Founders' Society is to be congratulated in undertaking these studies and the purchasing agents and engineers thanked for their helpful participation. Members of the society now have information on the needs of customers, the basis of any good marketing program, and this should be of great assistance in improving the sales activities of individual foundries. And, of course, the entire foundry industry can benefit from study of those portions of the research which have been given general release.

Frank G. Steinebach
Editor

## How To Control

# SHRINKAGE

By JOHN ALLAN
*Foundry Superintendent*
St. Catherines Brass Works Ltd.
St. Catherines, Ont.

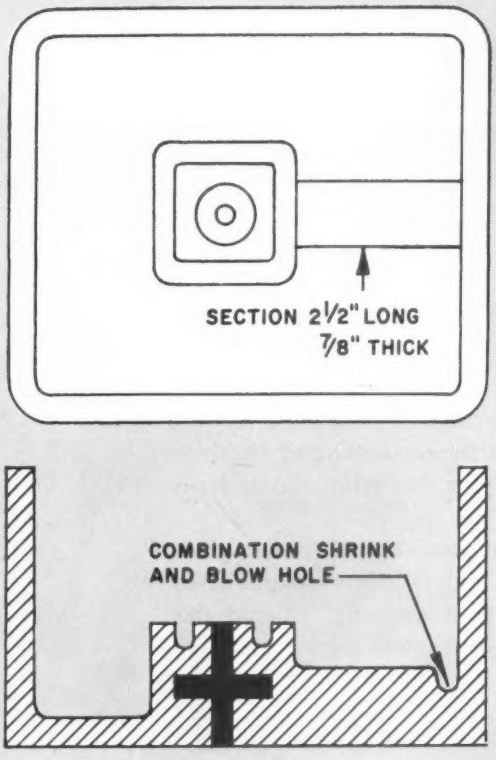
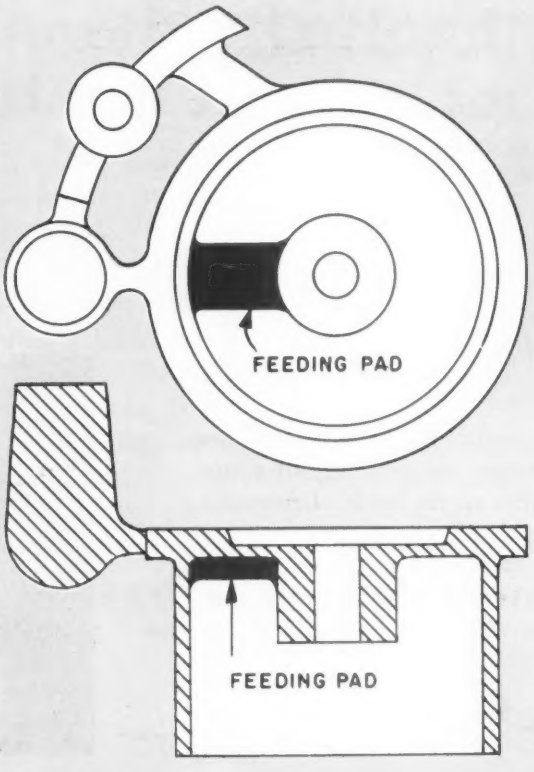



Fig. 1—One obvious type of shrinkage, a "suck" or "blink," often is a blow-hole caused by lack of head pressure

Fig. 2—Feeding pad helps to overcome shrinkage when an area is inaccessible to feeding by controlled solidification




LIQUID and solidification shrinkage in cast iron probably has received more attention from the conscientious foundryman than any of the other many problems which must be overcome to produce a "good" casting.

The reason "good" is so written is because so often the interpretation placed on the word decides whether a casting showing a shrinkage defect is either a reject or is commercially acceptable. Obviously an unstressed, unmachined casting containing a shrinkage defect is likely to be accepted, perhaps grudgingly, more readily than a casting which is called for higher duty.

A shrinkage defect appears in the form of a cavity, either large or minute, which is the result of varying rates of solidification and changes in the form of the iron carbon constituents. It occurs during the freezing range of the alloy. Usually a true shrinkage area can be recognized by its jagged or fir-tree-like appearance similar in color to that of a fresh fracture.

**Numerous Types**—Shrinkage appears in many forms. First, there is the obvious shrink, often called a "suck," which frequently is a blow-hole caused by the lack of head pressure. In well informed circles it rather neatly is dubbed a "blink." Such a defect commonly appears at the junction of two or more heavy sections, or at the junction of a heavy section with a light section, or in some part of an isolated heavy boss very often high up in the casting where feeding is difficult. Fig. 1 shows an example of a "blink."

Second, there is a general type of shrinkage which will show up in a casting of fairly uniform section in an area well away from the gates. This type of shrinkage appears on large flat castings of uniform thickness. It results from the unequal cooling rates set up by the manner in which the mold fills and by the passage of molten metal heating the sand during the pouring cycle. Although recent experiments have cast new light on the method by which a fluid fills a cavity, there

# IN GRAY CAST IRON

**The author has had wide experience in production of gray iron castings. His paper won first prize in the annual contest of Ontario Chapter of AFS and was presented at the 1956 All Canadian Conference**

is still serious doubt whether or not molten metal poured at the same temperature, at the same rate into the same gating system, will fill a mold cavity in the same way each time it is poured.

Because molding sand, with the moisture evaporated during pouring, is a fairly good insulator, it can be readily seen that more molten metal running over a particular mold area on one occasion, as compared with another, can alter conditions to such an extent that the gating system functions differently from one casting to another. Logically this could explain why castings poured under seemingly constant conditions from day to day vary in the degree of shrinkage exhibited.

The wise-acres will glibly explain that these defects are caused by the failure of the gating system to promote "perfectly controlled progressive solidification" or "properly balanced thermal gradients," from the areas of lowest temperature to the areas of greatest temperature which, theoretically, should be from the casting to the gating system. As usual, the experts are theoretically correct but, unfortunately, few of the experts have to contend with that scourge of competitive founding — yield.

Again, theoretically, most gray cast irons, depending on their composition, will shrink volumetrically from 2½ to 4½ per cent in cooling from pouring temperature to the solidus temperature. Ignoring the effect of exothermic feeding compounds or insulating sleeves, a cylindrical riser in sand is approximately 20 per cent thermally efficient. This means that a riser, to supply molten metal effectively at the theoretical liquid shrinkage rate, must originally contain five times the volume of molten metal theoretically required. This premise assumes that the molten feed metal is supplied to the casting in such a way that it feeds all over, or that all of the shrinkage is concentrated at one spot or one area which can be fed conveniently.

In the experience of most foundrymen, casting design being what it is, castings scrapped for shrinkage defects are scrapped usually because one area of shrinkage is inaccessible to feeding by controlled progressive solidification towards the gates or risers; consequently, such subterfuges as feeding pads or chills with their attendant headaches become necessary. Fig. 2 shows how a feeding pad helps overcome shrinkage.

If a shrinkage defect appears consistently day after day, steps can readily be taken to revise the gating system, probably by the old-fashioned "alter this" and "try that" method. Or metal composition or casting design can be altered in an attempt to overcome the trouble. But the one step dear to the hearts of all foundrymen (by long association) is the case where after scientific control of all the major variables, and the casting still shrinks one day and another day it doesn't, in desperation the job is withdrawn from production to see if resting the pattern will cure the defect!

The most probable explanation in a case such as this is that a casting causing shrinkage trouble after numerous checks is probably being poured in a metal of composition not properly suited to the casting design. Or the casting is under-gated to such an extent that there is just not the safety factor required to embrace the variations encountered in day-to-day production. The reason might be that because of price competition there are 12 patterns on a 12 x 16 flask when 10 on would be the maximum for good gating practice; or it could be that the boss has heard of a foundry operating on a 75 per cent yield (quite possibly making entirely different products) and insists that your foundry must also obtain a 75 per cent yield.

**A Matter of Design**—Then there is the case of the foundry running stoveplate iron of the order: Si 2.75, P 0.50, Mn 0.60, S 0.10, C 3.45. The foundry decides to make transmission cases for washing machines with those lovely big knobs de-

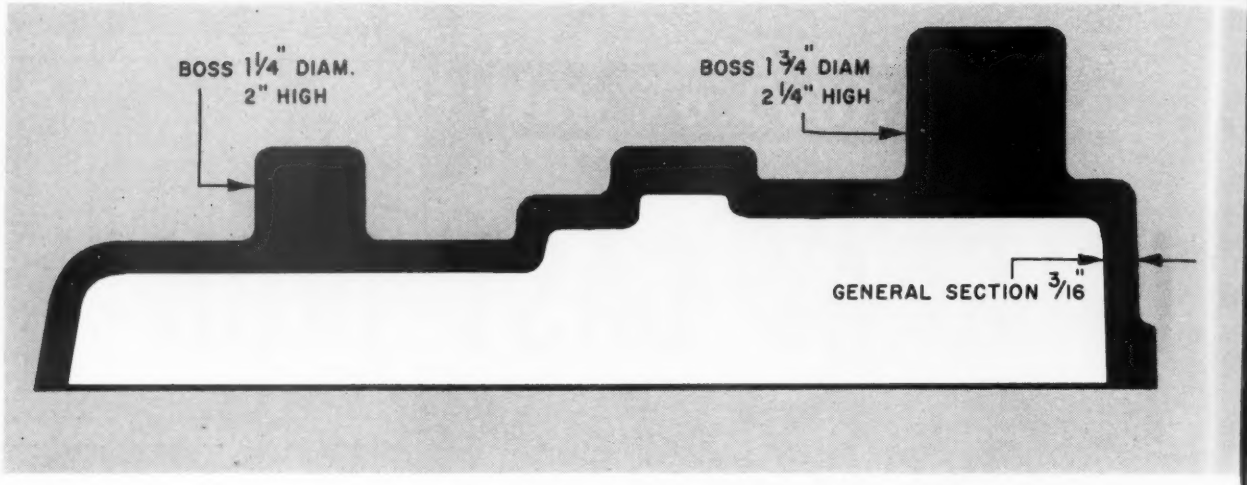



Fig. 3—This drawing illustrates the type of design, with heavy bosses on a thin section, which is very likely to cause trouble in the foundry

signers love to stick right on top of the thinnest section of the case, usually farthest away from any reasonable gating system. Fig. 3 shows a typical design which causes trouble.

The foundry business being what it is, a fair percentage of these castings will, with suitable impregnation, welding, peening and what have you, eventually find their way onto saleable washing machines. But when 15 to 20 per cent leak when pressure tested—as they assuredly will—then some bright engineer is sure to ask, "Why are 80-85 per cent good?" while the embarrassed foundryman stammers and stutters that "that is the foundry business for you."

The simple truth in this case is that the design renders satisfactory gating very difficult; and because the metal analysis is not the best suited to the requirements of the casting metallurgically, the factor of safety in using a high-silicon iron combined with high phosphorus is much too slender, and scrap must ensue. It is an astonishing anomaly that, if carefully melted and poured, sound castings can be made in a metal of a composition which theoretically is metallurgically unsuited to the application in question.

A third type of shrinkage occurs throughout the general section of the casting, either in the form of center-line shrinkage or intercrystalline shrinkage—that is, shrinkage around the grain boundaries. This type of shrinkage causes most "leakers" on pressure type castings and is usually found in castings of heavier section. It is the most difficult to control, calling for careful selection of alloy and a properly balanced gating system. The system must provide for the filling of the mold under scientifically satisfactory principles, controlled progressive solidification in the direction of the gates and correctly placed feeding heads. If the section is very heavy, melting should be done under carefully controlled conditions and special inoculation techniques used to effect the solidity penetration necessary to produce a sound casting.

Fourth is the "mysterious" type shrinkage. This is the type which was not there the last time the job was run, or "when the old molders poured that job 20 years ago it did not shrink." For the sake of the modern foundrymen let it be hoped that a 20-year-old casting can be found, because there is very little doubt that should this casting be sectioned in critical areas, unless the method has been altered, it will almost certainly reveal shrinkage at least as serious as the present defect. Very often the reason castings didn't shrink 20 years ago is because they weren't abrasive blasted!

Except for those foundries engaged in manufacture of very high quality work, too few foundry people take the trouble to section castings for examination. As a result, castings which very often are only superficially sound are submitted as production samples. Few machine shops will go to the expense of fully machining samples, and usually they issue an acceptance based on dimensional checking only. Too often when production machining is under way, shrinkage defects are revealed and many castings are scrapped for causes which proper early examination would have revealed. In such a case there is very little doubt that had the part in question been sectioned and polished in all suspect areas, incipient shrinkage would have been revealed and steps could have been taken to correct the defect before thousands of castings had been made.

Improper early examination of castings, coupled with the general desire on the part of most foundry people to have the standard of inspection set as close to the lowest limit as possible, have caused more headaches and mysterious shrinkage defects than can be dreamed of. It is granted that pressure on foundries to produce a low-cost product has sparked the quest for higher and higher yields; but this is no reason why experienced people who should know better repeatedly undergate and underfeed castings.

Technological progress made over the years goes for naught when a foundry fits a ½ x ½-in. run-

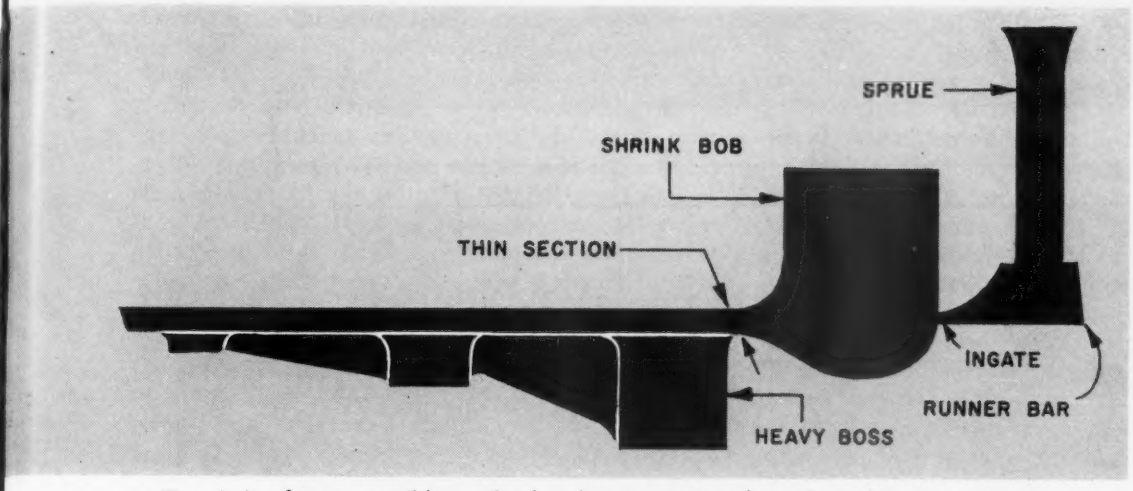



Fig. 4—It often is possible to feed a heavy section through a thinner one by passing more metal over the thin section than the mold requires

ner bar and two strip gates to a casting of general 1-in. section in the hope that enough castings won't show gross porosity or severe shrinkage to return a 72 per cent yield of castings produced to metal melted. While every-day economics dictate that the least possible weight of metal be used for gating and risering, the author is firmly convinced that many bad castings which are scrapped for shrinkage defects are scrapped because they are under-gated.

Castings rarely shrink for any one reason, although there is usually one major cause of shrinkage in any particular casting; yet there is little doubt that good gating practice coupled with proper alloy selection will cure a large percentage of shrinkage defects.

An alloy metallurgically unsuited to a particular casting, when over-gated, can produce sound castings just as the best possible alloy poorly gated can also produce a high percentage of acceptable castings.

In writing this paper some care has been taken to associate liquid and solidification shrinkage with metal composition and gating procedure because, fundamentally, without a satisfactory choice of a good combination of both for a casting of given design, castings of lower quality than necessary must result.

Even with the proper selection of gating and metal composition, however, many shrinkage defects can appear and it is suggested that the following factors have a considerable bearing on such shrinkage defects: Pouring, metal temperature, melting conditions, sand deformation, sand moisture content, sand permeability, mold density, degree of fit between jackets and molds, molds either short poured or not topped up, weights shifted too soon. Discussing these in order, some indication of the impact of carelessness or lack of knowledge is shown.

**Pouring**—Theoretically, a casting cannot shrink if the rate of supply of molten metal is equal to the rate of shrink. Proceeding on this premise, a casting should be poured as slowly as possible commensurate with the complete filling of the mold. Apart from any sand problems resulting from this approach, the application of the theory is difficult because of the different thermal gradients set up in various parts of the casting unless directional filling of the mold is guaranteed.

For example, it is often possible to feed a heavy section through a thinner section by passing more metal over the thinner section than necessary for the filling of the mold. The heat input into the sand surrounding the thin section is, of course, proportionately greater by the amount of extra molten metal in contact with it; consequently, this artificial hot-spot keeps the gate open for feeding the heavier section. A classic example of this is in the knock-off type shrink bob or riser so popular today, where the casting is run by gating through a side riser connected to a local heavy section by a fairly small opening. Fig. 4 shows how this works.

It can be seen that by careful direction of the molten metal to the heavy sections in such a manner that perfectly controlled progressive solidification is practicable, slow pouring will mimimize local solidification shrinkage defects. Fast pouring beyond the rate required to fill the mold, while highly desirable in avoiding some sand defects, is a factor in causing shrinks in local areas. The ideal way—a compromise as usual—would be to start off pouring at a fast rate to get a cushion of molten metal into the mold and then slow the rate of pour closer to the shrinkage rate.

Most experienced practical foundrymen will agree that very few molds are poured in accordance with the gating system used. Some pourers will pour more slowly than others, some with ladle closer or farther away from the basin or sprue. Some will pour against the side of the sprue, and some will plunk the metal right down the hole. Very few will "top up" the sprue or riser as it shrinks, and metal temperature has been known to vary from day to day, ladle to ladle or mold to

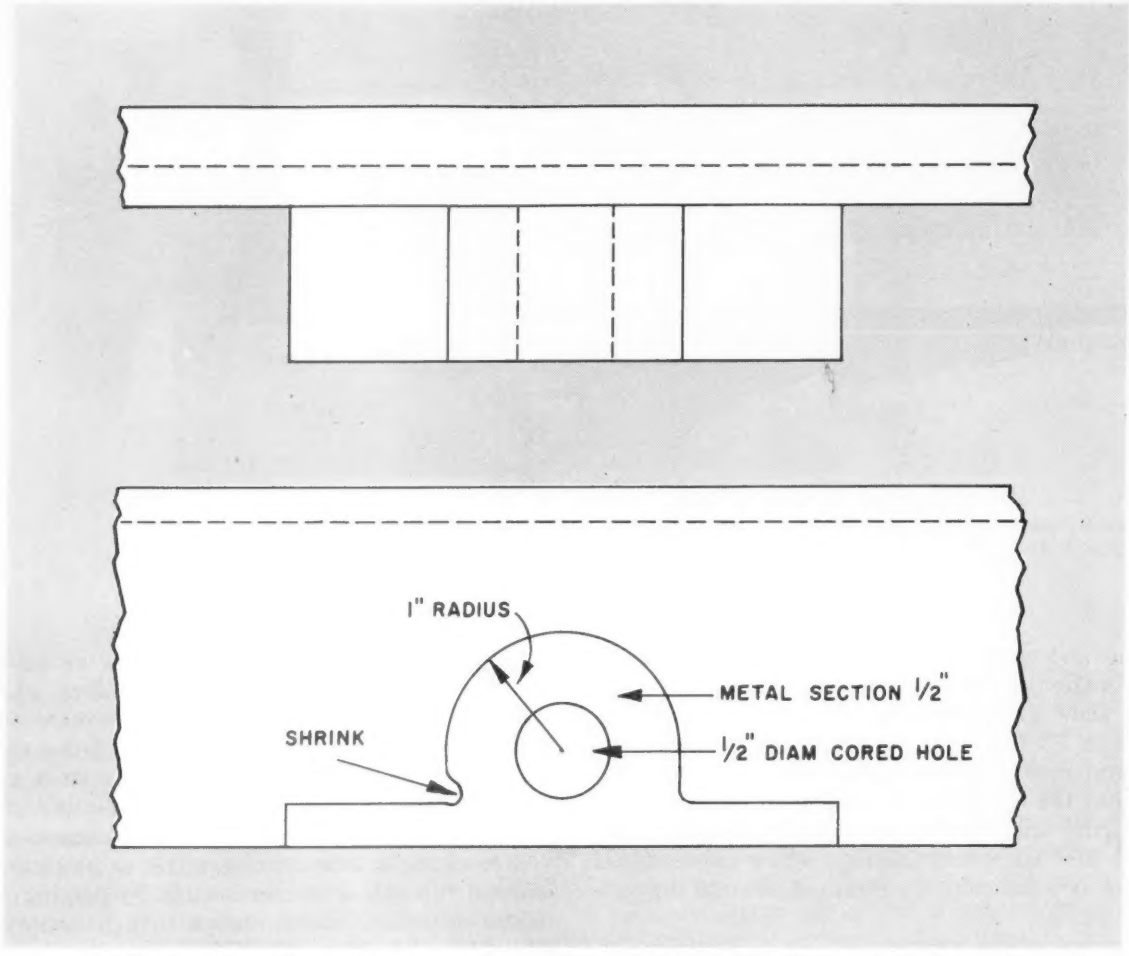



Fig. 5—When identical castings of 3/16-in. general section were made in natural and synthetic sand, the one in synthetic sand (above) showed shrink (See Fig. 6)

mold. Because any gating system is only perfect for one set of conditions, any change in the *use* of a gating system actually is tantamount to changing the gating system itself.

**Metal Temperature** — There just isn't enough space to discuss all of the effects of metal temperature on shrinkage defects. Suffice to say that it is logical to assume that if a particular metal temperature is found to be best for a particular troublesome casting, every effort should be made to maintain such a temperature for pouring. But here is the rub—while controlling temperature at the cupola spout is the first necessary step, the difficulties in getting metal at the correct temperature to the molding floor are manifold.

When a pourer runs the bull ladle into the cupola stream, sometimes the ladle is empty and sometimes it isn't. Sometimes he returns immediately from the emptying and sometimes five or more minutes elapse before he comes in for a refill. Sometimes he must wait for other traffic to disperse from the cupola. The point is that the mechanics of handling molten cupola metal make it extremely difficult for temperature conditions at the pouring station to be duplicated repeatedly. When most foundries, on the grounds of economy, have the skimpiest possible gating systems on a casting, variation in temperature is critical.

**Melting Conditions** — Much has been written about the effect of melting conditions on metal quality. Because metal quality affects so many things other than shrinkage, it is imperative that melting conditions permit delivery to the pouring floor of consistently unoxidized metal of closely controlled analysis and temperature. From a shrinkage viewpoint it probably would be better to supply consistently "bad" metal rather than one of varying analysis and temperature; a constant condition can be accommodated whereas variables are especially troublesome in these days of mass production and unskilled labor.

**Sand Deformation**—Deformation is defined as "a change in linear dimension of a sand mixture subjected to an applied stress." For the purpose of this paper, deformation and mold density can be discussed as one; the effect of both on casting shrinkage is very similar.

Very simply, a casting made in either a mold of low mold density or high sand deformation is likely to shrink in a local heavy section or high up in the mold. The reason is that soon after the mold has been filled, and after the extraneous supply of molten metal has been cut off, the sand mold fails to resist the outward pressure of the molten metal filling the mold, and yields slightly. As the mold yields, the molten iron naturally sinks

downward in the mold, and as the supply of metal has been cut off there is no compensation for the downward movement; hence, a mysterious shrink.

The above explanation is only half the story. The real headache in this type of shrink or a shrink springing from this source is the one where sand deformation is suitably low but the mold, although sufficiently dense close to the pattern, is softer say ¾ to 1 in. back from the pattern. In effect, the casting swells, causing a shrink because there is no liquid metal replacing the swell.

One sure way of establishing whether or not the above conditions are accounting for shrink is to weigh the castings affected and compare their weights with that of a sound casting. The shrink castings should weigh at least as much as the sound casting and they would be heavier if they swelled and were sound. A casting of ½ in. section swelling 1/64 in. all over will need 3.20 per cent more metal to make it sound than a ½-in. section casting which does not swell at all. This 3.20 per cent can leave a nice big hole in a casting even if the casting weighs only 5 lb, and it is suggested that few foundrymen work to limits of 0.015-in. on general casting dimensions.

**Permeability**—Heat transfer through sand molds is difficult to measure because of the different mediums by which heat is transferred—radiation, convection, and conduction from grain to grain of sand. Temperature of air not evacuated rapidly from the mold rises very quickly—much more so than the temperature of molding sand. Trapped air at high temperature in a boss, for example, will act as an insulator and unbalance any normal thermal gradients in a scientifically balanced gating system long enough to cause a shrink. Pressure of the air or gas is reduced by its escaping through the sand at a rate governed by the permeability of the sand, and it is suggested that there is a critical permeability range in dealing with some shrinkage factors.

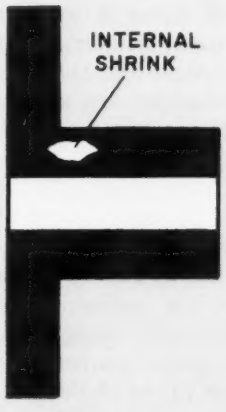
While the applications are not entirely analagous, some comparsion might be made between a shrink caused by lack of permeability in a boss in an iron sand casting and a shrink in a boss of an aluminum permanent mold casting. It has been found that a shrink in a boss in permanent molding, all other factors being balanced, can be eliminated by fitting a vent plug in the mold at the critical area. All the vent plug does is to allow rapid evacuation of the air in that vicinity, similar to what permeability does in a sand mold, and the elimination of a hot spot permits the die to chill the necessary area.

**Moisture Content**—In its simplest impact, moisture affects shrink by the degree of chill given the first metal in contact with moist sand. Fig. 5 shows one of two castings made from the same pattern with the same gating system and poured from the same ladle of iron. One casting showed a shrink, while the other apparently was sound. The former was made in synthetic sand with moisture content of 3.1 per cent, and the other was made in natural sand with a moisture content of 6.5 per cent. The obvious conclusion was that the difference in moisture caused the difference in apparent shrinkage.

Fig. 6 shows the same castings sectioned in the critical areas. Both castings would be expected to shrink by the same amount and, as indicated, the one on the left actually is only superficially sound. Nevertheless, it is a saleable casting while the casting at right found its way back into the cupola. It is the author's experience that, because of shrinkage conditions just described, different gating techniques are necessary in making saleable castings in synthetic sand than in natural sand.

**Jackets**—Poorly fitting jackets on snap flask work account for a lot of mysterious shrinks. Movement of the mold materials immediately after the mold is filled (the time of maximum pressure) causes the metal to sink similarly as described under the effect of mold density and deformation. Here, too, is a possible explanation of why a job will shrink from time to time.

**Weights Shifted Too Soon**—Many strained castings are caused either by the weights (speaking of snap flask molding) being moved too soon or by the weights being too light to combat the lifting pressure generated during pouring. A strain caused by either fault will often be accompanied by a shrink high up in the casting.



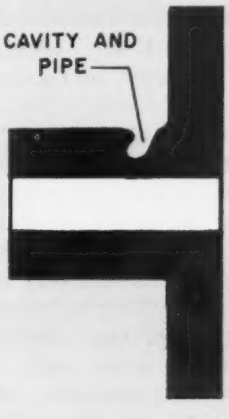




Fig. 6—Shrinkage actually occurred in both castings referred to in caption for Fig. 5, but shrink was internal in casting made in natural sand and did not affect its saleability. This experience indicates that castings made in synthetic sand need different gating

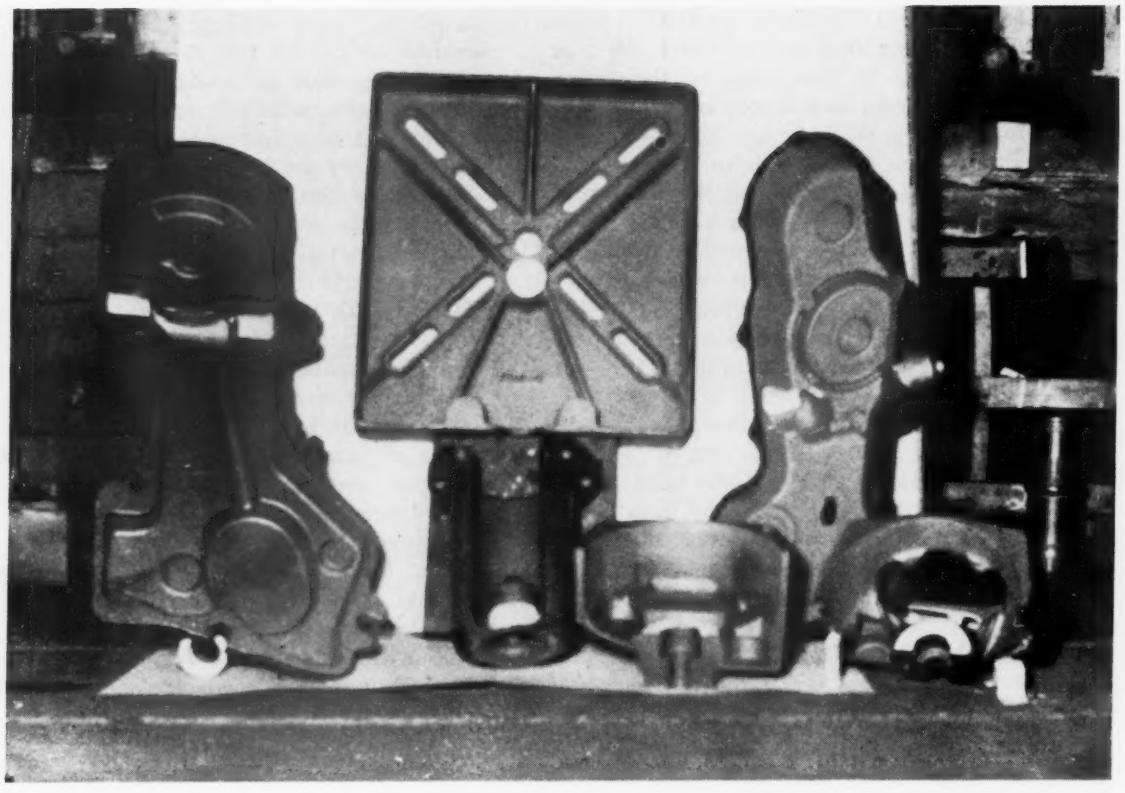


Fig. 7—In these castings, chills (in white) were instrumental in permitting sound castings to be produced economically with no reduction in yield

Summing up, it would seem that there are many minor and few major causes of foundry loss due to shrinkage defects. The lesser causes—pouring rate, metal temperature, melting conditions, sand deformation, mold density, moisture content, jackets' fit, molds short poured or not "topped up," weights shifted too soon, and sand permeability—can collectively account for a lot of rejected castings; and chiefly because they are "transient" causes of scrap they are very difficult to pin down except by careful supervision and close controls.

The major factors influencing shrinkage, in the order listed, are undoubtedly: Casting design, gating technique, and selection of alloy in relation to design.

**Casting Design** — Despite all that has been written or said about the desirability of uniform metal section, probably no iron foundry does not have its quota of castings in production today which have isolated heavy bosses or rapid section changes in areas very difficult to feed by the best accepted gating techniques.

Although engineers and foundrymen are working much more closely than heretofore towards a better understanding of design problems as they affect foundry production of sound castings, there is still a tremendous unexplored field of cost reduction to be developed in casting design. Most foundrymen will agree that casting design can be the biggest single factor in making or avoiding castings containing shrinkage defects.

**Gating Techniques**—The principles of controlled progressive solidification have been accepted and understood by foundrymen for many years, and there is little doubt that where employed, application of the theory has improved casting quality beyond measure. Complete acceptance of the theory demands the use of risers in areas where the gating system cannot feed, without considering yield primarily, but even where the theory is accepted in principle the difficulty and cost of removing risers often leads to the casting being underfed.

In promoting controlled progressive solidification in ferrous castings, one medium which has not found the acceptance it deserves in the iron foundry is the use of surface chills. Admittedly there are difficulties in their use, but the author has found many applications where costly, unsightly risers have been avoided by the judicious use of chills. Fig. 7 shows a few castings where chills have been instrumental in permitting sound castings to be

produced economically with no reduction in yield. In using chills, care must be taken either to fit the chill to a face which is not machined—even though part of the section which is chilled probably will be machined—or to make the chill light enough to allow self-annealing of the chilled section; otherwise an unmachinable part might be produced.

Even in this day of advanced technology it is doubtful if as many foundries as should apply really scientific methods of gating and feeding. This paper is intended primarily as a discussion on shrinkage defects and their many possible causes, not as a general treatise on gating and risering. However, since shrinkage is affected to such an extent by gating and risering, it may be advisable to suggest the steps which should be considered in selecting a gating system for a particular application.

From the formula $V = \sqrt{2gh}$, where V = velocity, g = gravitational constant and h = height, it can be shown that molten iron poured from a height of 8 in. will pass through a 1-in.-sq aperture at the rate of approximately 1000 lb per minute. Knowing the weight of the casting and having decided on how quickly the mold should be filled, it is comparatively simple to calculate the total ingate area required to fill the mold in the desired time. Knowing the area of the ingates makes easily possible the proper balancing of the gating system in accordance with whatever theory is in favor at the time.

The gating system should be designed to supply an adequate amount of molten metal to all critical areas where shrinkage is likely to occur. Unless a casting has been designed to assist progressive solidification there will probably be areas or sections which are difficult to feed. In this case risers, feeding pads and/or chills should be used, because unless solidification is progressive from the casting sections to the reservoir of feed metal, soundness can only be by chance.

**Alloy Section** — The American Foundrymen's Society's *Cast Metals Handbook*, under the heading "Specific Application of Alloy Cast Irons," lists 283 different cast irons for various requirements in the engineering field. It might not be a fact that each different alloy requires a different gating system, but it almost is a fact that each foundry making castings in these various alloys has different ideas on how they should be gated. The fact that the investigators who compiled the list of 283 irons saw fit to include that number would indicate that special types of castings do require special metal analyses.

Generally speaking, casting soundness is a function of casting section in relation to chemical analysis. Although the author has no conclusive proof, there is very strong evidence which suggests that molten iron produced to a given analysis by *different charge components* will reveal different solidification shrinkage characteristics. The use of high-silicon pig iron with low cupola additions of silicon briquet or ferrosilicon, will produce iron which will make a higher percentage of shrunk castings than an iron of the same analysis produced by the use of low-silicon pig and high cupola additions of silicon briquets or ferrosilicon *with all other charge components constant.*

Consider an iron of this analysis: Si 2.65, P 0.50, Mn 0.65, C 3.40. It will be gray, sound and machinable in a 3/16-in. casting section. The same iron poured in a ¾-in. section will undoubtedly exhibit coarse interdendritic porosity and will have a very low tensile strength.

Iron of the order Si 1.75, P 0.12, Mn 0.65, C 3.25 will be sound, gray and machinable in the ¾-in. section, but the fracture of a 3/16-in. section poured in the same iron—if it runs at all—will be white, and the part as cast will be unmachinable.

The fact that castings of 3/16-in. general section often have bosses of greater than 1-in diameter and 1-in. length spots the major significant cause which hinders the production of shrink-free castings. To guarantee soundness, two or more types of metal would have to be poured into any individual casting, where the design shows different casting sections and local heavy bosses.

Shrinkage is generally associated with castings of heavy section or castings with rapid section changes, but the accompanying Fig. 8 shows a casting of general ⅛-in. section where the shrinkage is quite pronounced. This casting must be readily machinable and to effect this quality in such a thin section demands that a hypereutectic iron be used. Here is an instance where, from a shrinkage point of view, the iron used is unsuitable, but in order to get the desired machinability it is necessary to use a hypereutectic iron.

It is interesting to note that this casting, if made in natural sand with 6 per cent moisture from a metal analysis of Si 2.90, C 3.40, S 0.10, Mn .60 will not exhibit gross shrinkage. If the casting is poured in synthetic sand with all other conditions constant, however, the casting will exhibit gross porosity. In conclusion then, shrinkage-free castings can best be produced with good combination of good casting design, scientific gating practice, proper selection of alloy and close attention to detail on a day-to-day basis.

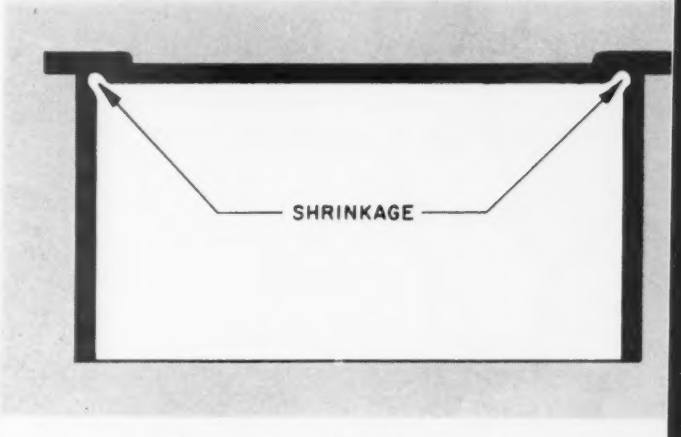
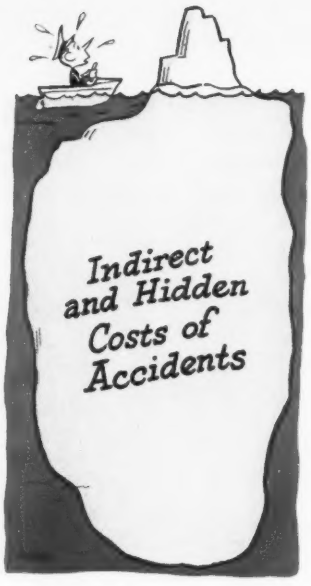



Fig. 8—In this casting of ⅛-in. general section, shrinkage occurred because hypereutectic iron was used to obtain the machinability needed

Safety is a primary responsibility of top management




Industrial accidents cause unavoidable expenditures

Good lighting adds to safety and efficiency of employees

# SAFETY ... Is Good Business

By JACK C. MISKE
*Associate Editor*

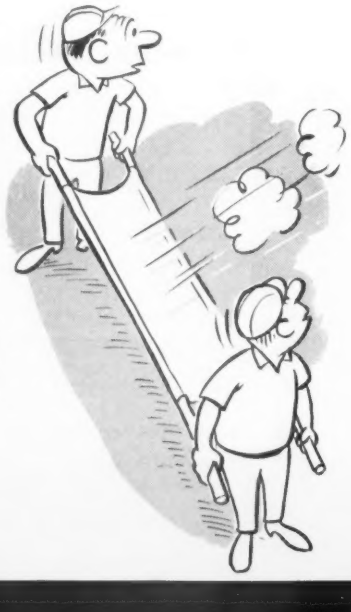
IN ANY industry, the attitude of management always is the key to the success or failure of a safety program. Any group trying to promote safety first must instill safety consciousness in the members of top management. To do just that, the Safety Committee of the Steel Founders' Society of America recently compiled and published an *Accident Prevention Manual for Steel Foundry Executives.*

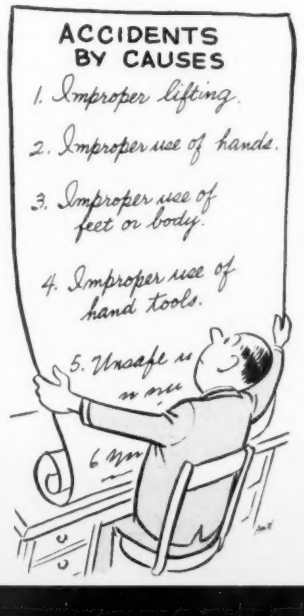
A handsome, illustrated, two-color, hard-bound job, the book actually is not so much a manual of instructions on the conduct of a safety program as a manual on the responsibility of management "to control the safety and health of its employees while on the job." As such, it describes a seven-point program for company presidents, operating vice presidents, plant managers and similar management members of foundries of any

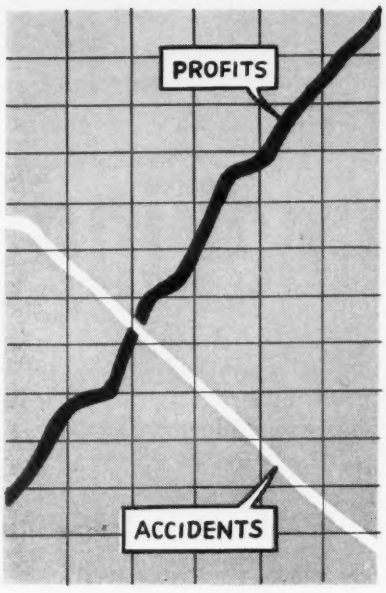
All serious or near serious accidents should be reported

Dispensaries must be equipped properly so that they can be ready to function with efficiency

Complete accident records help to pin-point causes








A workable organized safety program will save you money

Management bears the cost of most required equipment

Employees should be trained to respond properly to fire

type, but it does not attempt to go into detail.

The illustrations which accompany this article are taken from the manual and serve to exemplify some of the areas covered. The seven points referred to above include the following: "The Real Need for an Effective Safety Program"; "Safety and Health Program"; "Training of Employees"; "Safety Engineering"; "Plant Fire Prevention and Protection"; "Medical Facilities and Care"; and "Accident Records." Each of these sections is the work of a member of the society's Safety Committee. The manual concludes with a note on reference books on safety.

**What Can Be Done**—Statistics are a pretty dry business, but a couple of them serve to show the value of a co-ordinated safety program. The SFSA began its continuing campaign in 1941, in which year the accident frequency rate for its members was 42.1. Since then, that rate has been cut more than in half. In 1955, it was 18.3. In 1954, at the end of its first year of membership in the National Safety Council, the society was cited for its outstanding work in the promotion of safety (See FOUNDRY, August, 1955, p. 110).

To supplement the new safety manual, the Safety Committee now is at work making up step-by-step procedures to aid individual member foundries with their safety programs. This material will enlarge upon points brought out in the *Accident Prevention Manual.*

The manual was distributed to the chief executive of each of the companies which are members of the society, and many have bought additional copies for other top management personnel. The society also is prepared to make copies available to other persons and companies interested in furthering safety promotion. Copies are $4 each from the Steel Founders' Society of America, 606 Terminal Tower, Cleveland 13, O.

Some companies have used union stewards successfully as safety committeemen who work together with foremen on safety matters

# Plastics in Patternmaking

**Advantages of plastic patterns and coreboxes and how they are made are described here. This paper expands on one presented at a T & O Conference of Steel Founders' Society of America**

By PAUL von COLDITZ
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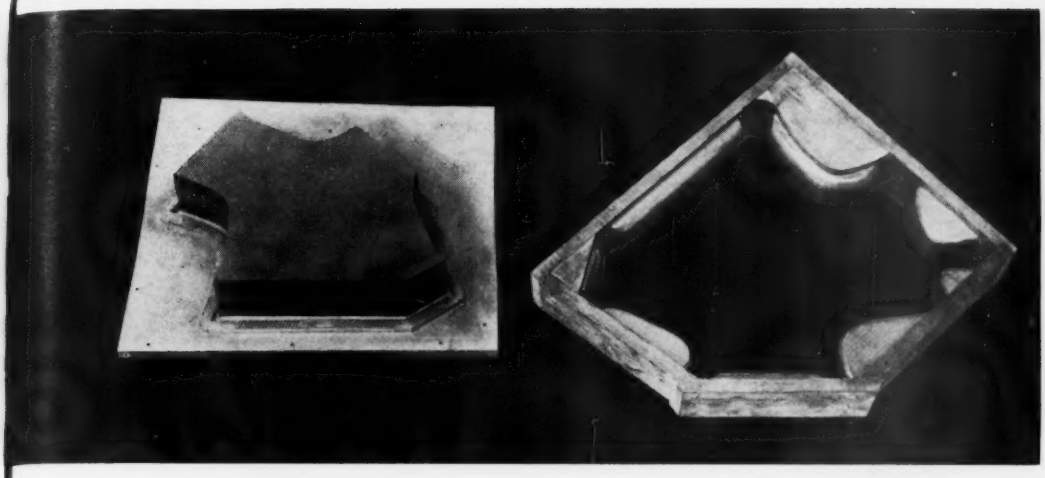
Montreal, Quebec



The plastic core print and outside form ready for laminating

FOR some time Canadian Steel Foundries (1956) Ltd. has been concerned with the rising costs of patterns and coreboxes for machine molding. These items have become an ever increasing percentage of our production costs, and a definite cost factor on both miscellaneous and production runs. This has been particularly true where intricate pattern shapes were involved. Complex patterns require long hours of skilled labor and, in some cases, expensive machine tools and equipment.

In 1953, a number of phenolic patterns and coreboxes were purchased for a trial run, and we were impressed with the ease of construction to the desired shape. However, it was found that these patterns were too brittle, required extensive repairs, and did not bond to other materials.

In 1954, while searching for improved plastics and better methods, we started our own experiments with epoxy plastics, and a program of experiment and development was initiated with reinforced plastic patterns and coreboxes.

The epoxy resins immediately proved satisfactory, because of their ability to bond to other materials and their high strength. The following advantages also increased our interest in the wider use of plastics: Dimensional stability, high compressive strength, excellent adhesive qualities, impact resistance, wetting ability, chemical resistance, high flexural strength, high abrasive resistance, easy release from molding sand, reduced weight for multiple coreboxes.

Since then we have successfully produced hundreds of patterns and coreboxes, and have greatly improved our methods of production and the quality of our plastic patterns.

**Types of Resins**—With the advent of new formulations, faster and more economical methods of construction of patterns and coreboxes have been developed. A variety of formulations may be compounded, each suitable for a special application.

The following are Canadian formulated resins, and from them, several different types of resins and catalysts may be selected for any one pattern or corebox. They should be chosen for their machinability, abrasive resistance and dimensional stability, coupled with their over-all cost. (For instance, cheaper filler resins should be employed for back-up purposes, etc.)

No. 100-Gelcote resin is a machinable surfacing resin which has dimensional stability and the ability to cling to vertical faces. As with all types of gelcote resins, it is usually backed up with a fiber-glass laminate for additional strength, keeping the fabric as close to the surface as possible to avoid chipping.

No. 101-Gelcote resin is an abrasive-resistant resin. It has much the same characteristics as No. 100 resin excepting its hardness to machining. It may be machined with carboloy tipped tools or silicon-carbide buffing wheels. It will provide a mirror-like surface, providing the surface which it is cast against has been polished, and has the ability to pick up the finest detail.

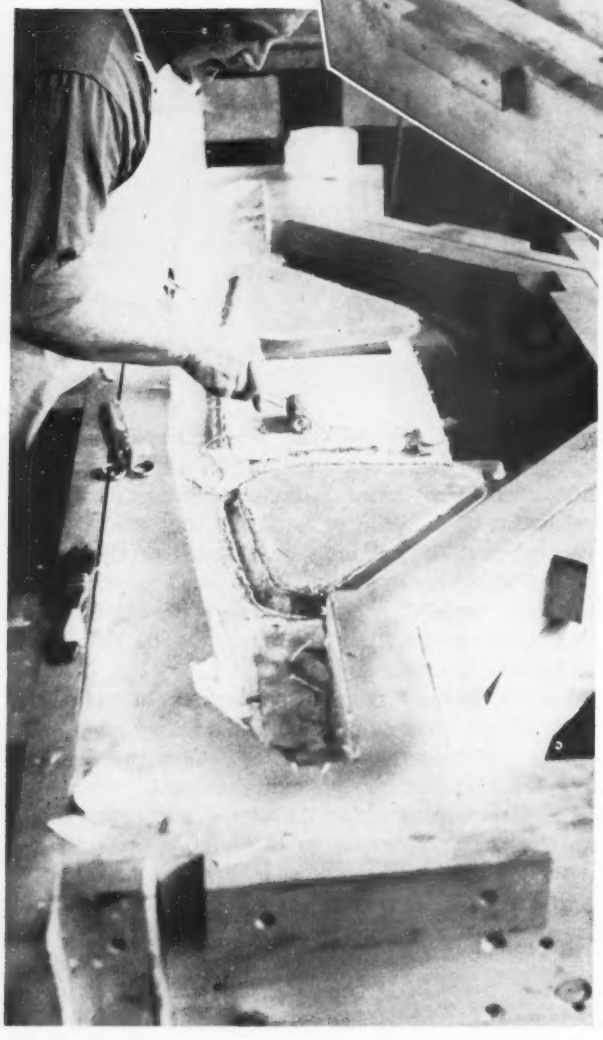
No. 102-Gelcote resin is an exceptionally hard surfacing resin. We are currently using this resin to repair coreboxes and patterns, or where rapid alteration is to be made in box or pattern. By the application of heat it will be found to gel in a matter of minutes.

No. 200-Laminating resin can be used to laminate the mold or form after a coat of surfacing resin. It has the ability to wet the fiber-glass fabric instantly and will furnish a bond that will not part. This resin is light in weight and is dimensionally stable with high impact, high flexural and compressive strengths, and can be used as a light back-up. However, care must be taken with this type of resin to avoid producing an exothermic reaction which will cause the resin to harden too rapidly.

No. 300-Casting resin has a highly abrasive-resistant surface and can be used as a general purpose resin in the pouring of small patterns or miscellaneous work. As with No. 200, it will set up

◀ Drying a plaster mold in an oven is one of the first steps in making epoxy resin pattern. Mold is made from the master pattern

Plaster mold ready to be laminated. It was made from a pine pattern for a freight car side frame



Rolling in glass fiber cloth on a plastic mold eliminates air pockets in laminating

Plastic print for core blowing box constructed by blocking off around patterns

an exothermic reaction in large quantities.

No. 410-Core resin is used as a black-up resin. Its low exothermic tendencies result in low shrinkage, and it machines easily.

No. 420-Core resin can be used as a filler due to its light weight, but is not as strong as No. 410 resin.

No. 502-Clear resin is machinable and, because of its excellent flowability, can be used where a thin coating is desired. Its use is not advisable in bulk because of the exothermic reaction.

**Mixing the Resin**—The end product, pattern or corebox, will depend on the care taken in mixing the resin. A poorly mixed batch will produce pinholes, improper curing and a surface lacking in gloss.

Both the resin and its particular catalyst must be carefully weighed in the proper proportions prior to mixing. The catalyst or hardener is then added to the resin and thoroughly mixed. Mixing is done in discarded tin cans, and will require up to ten minutes to thoroughly mix. The life of the resin in the pot is approximately ½ hour, consequently any single mix should be limited to an amount of resin that can be used up in this time. The life of the resin may be extended by cooling, and using shallow pans and frequent stirring.

To hasten curing time, a slightly higher amount of catalyst may be used. The ideal room temperature for mixing and applying these resins is 70°F —higher temperatures will tend to hasten curing and cause distortion.

**Tools and Materials**—Tools and materials required in the manufacture of epoxy resin patterns and coreboxes are inexpensive and readily procurable. For an investment of $250 any shop can have the necessary equipment.

The items necessary to equip a pattern shop for production of reinforced plastic patterns and coreboxes follow:

1. Balance in grams by weight ($38).
2. Spray gun, Binks No. 19 ($40).

3. Oven (28 x 24 x 20½), maximum temperature required 450°F ($150).

4. Spatulas for spreading fiber-glass cloth.

5. Paint brushes.

6. Empty fruit or vegetable cans which may be discarded to avoid cleaning expensive utensils.

7. Fiber-glass tooling cloth 0.008 and 0.013 in.

8. Fiber-glass tooling cloth ribbon 3 in. wide.

9. Fiber-glass mat used as a filler.

10. Fiber-glass fibers used as filler ½ to 1½ in. long.

11. Blue mold release agent (polyvinyl alcohol).

12. Hydrocal B-11 plaster or Ultracal 30.

13. Auto primer surfacer and thinner (a plaster filler).

14. Sanding sealer lacquer, (for wood or plaster).

15. Plaster-cote (vinyl release agent with additives).

16. Wax and water putty for patching plasters and wood.

17. Plasticine clay for molding.

18. Sandpaper, No. 320-C for fine sanding purposes or grit cloth.

19. Small paint rollers for rolling out air pockets when laminating.

20. Polyken tape.

21. Scissors.

22. Abrasive disks.

23. Potter's soap for releasing plaster from plaster.

24. Celastic tape for alterations.

25. PVA (polyvinyl alcohol) sheets used on vacuum forming.

## PATTERN CONSTRUCTION

Following are the steps in construction of a plastic pattern.

1. *Master Pattern* — A master pattern is constructed in wood, using the required shrinkage to suit the type of metal to be cast. This method eliminates the double shrinkage required when constructing a metal pattern, and also allows the sampling and dimensional proving of the master pattern. The savings here alone are considerable, as it is much cheaper to alter a wooden pattern than a finished metal or plastic pattern. The required time for sampling is also reduced by the trial use of the master pattern instead of waiting to sample the finished pattern.

2. *Plaster Mold (Construction)*—A plaster cast is taken from the approved master pattern, and well dried (125°-150°—24 hours) to eliminate any moisture. Any imperfections in the plaster surface are repaired by building up with either plaster or a hard wax. Care in the treatment of the plaster will pay dividends in the surface of the finished pattern.

A sealer is applied to seal the plaster from the resin and to prevent the resin from contacting any moisture from the plaster. Sanding sealer lacquer (nitrocellulose) will give a fine luster to the mold as well as a seal. Two or three coats should be applied with a paint brush, sanding between coats, and a last coat rubbed on with a cloth. An added coat of paste wax, polished, will give added luster to the plaster. The plaster mold is now ready for laminating.

3. *Laminating the Mold*—The first step in laminating the plaster mold is to cover the mold surface with a thin layer of gelcote abrasive-resistant resin; it may be spread on with a spatula or paint brush. The resin is then allowed to set until it becomes tacky. A layer of fiber-glass cloth is spread over the entire mold surface, joints being overlapped for added strength. To avoid air pockets the cloth should be pressed against the resin with a spatula. On large molds a small paint roller may be used to roll out any air pockets.

Following the application of cloth, a coating of laminating resin is spread over the cloth to wet it down and furnish a bond between gelcote and cloth. (It has been found that one or two layers of cloth with a layer of mat are all that is necessary for surface strength on pattern equipment.)

Following the laminating of the pattern with an abrasive-resistant resin, a fill is added. On small patterns a fill such as Nos. 410 or 420, with a back-up of casting or laminating resin for strength, is sufficient. In the case of large patterns, ribs may be added of tempered masonite or plastic ribs cast to suit the cavity. The pattern is now allowed to cure and removed from the plaster mold.

## CONSTRUCTING AN OPEN COREBOX FOR BLOWING

A plaster cast is taken from a master corebox or from an existing box. Discrepancies such as breakage or wear are rectified, using plaster, wax, or celastic for build-up.

Treatment of the plaster is substantially the same as in making a pattern. After the application of a sealer and wax, prints in the shape of core vents are cemented to the plaster to avoid drilling in the hard plastic. The plaster is waxed, treated with several coats of release agent, and is ready for mounting.

Before laminating, the plaster must be secured to a plate to assure that there is no movement and that no plastic will run under the plaster form.

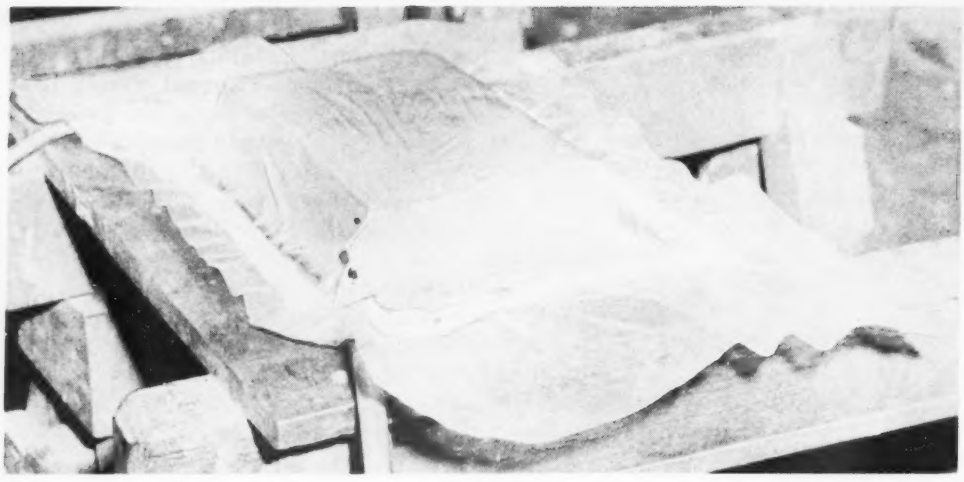
The plaster may be secured by three different methods.

1. For small plaster forms, the plaster may be secured by cementing plaster to plate with contact cement.

2. For medium-sized plaster forms, the plaster may be secured by casting in holding magnets. This is done by holding the magnets on a metal bar over the open end of the box, then pouring the plaster around the magnet. The plaster is then located and secured to the plate by the magnets.

3. For heavy plasters, metal dollies are cast into the plaster. The plaster is then located on the plate. The plate is drilled to match the dollies, and the plaster is secured by screws through the plate.

Once the plaster is firmly fastened to a plate by one of the above methods, it is ready to be laminated.



Affixing the resin to a corebox by means of vacuum. The vacuum is maintained for three hours or until plastic is cured

A coat of gelcote is currently being applied, followed by one layer of fiber-glass cloth and one layer of mat.

To gain additional strength and improved surfaces, the resin may be affixed under vacuum. This consists merely of covering the resin and plaster with a sheet of VPA 0.0015-in. thick and sealing with putty. The vacuum hose is fastened against a layer of felt (to prevent the plastic from entering the hose), and the resin is forced down to form a very hard, closely knit surface. The vacuum should be maintained for three hours or until the plastic is cured.

To form the outside of the box, an inexpensive wooden frame is constructed. The inside of the frame is lagged up with seven-ply, polished chip board to eliminate polishing of the wood. Standard metal lighteners are fastened to the frame and waxed, using a paste wax. A release agent is then applied, and the inside of the frame is ready for laminating.

The frame, or that which forms the outside of the corebox, is laminated in the same manner as the interior plaster form. The laminated wooden frame is then placed over the laminated plaster.

Approximately 1½ in. between frame and form is allowed for a rubber strip to be cemented to the open side of the box for a seal.

When the frame is in place, steel extension bars welded to the desired shape are inserted for added strength. An inexpensive filler resin is then used to complete the corebox.

The resin is allowed to cure, the form removed, brass vents are inserted, and the box cleaned up ready for use.

**Patching**—Sometimes it is necessary to repair or alter pattern equipment. In many instances this has been done by applying precast sheets of different thicknesses to the required position. Epoxy sheets laminated with fiber-glass cloth are made from 1/64-in. and up to control size. These sheets may be cast by two different methods:

1. A polished metal plate is coated with two layers of blue mold release. A coating of epoxy resin is then painted on and fiber-glass cloth bedded in. Spacers of the desired thickness are applied and a top plate (also coated with mold release) is pressed down and clamped. The sheet is allowed to cure and plates of the desired size are removed.

2. In this second method a polished plate is painted with resin after treatment of blue mold release. Fiber-glass tooling cloth is rolled in, and the plate is left to cure. This is repeated and then the two laminated halves are bonded together with a coating of resin and with spacers in between to obtain a sheet of the desired thickness. This method eliminates the possibility of any air pockets and gives a very smooth surface.

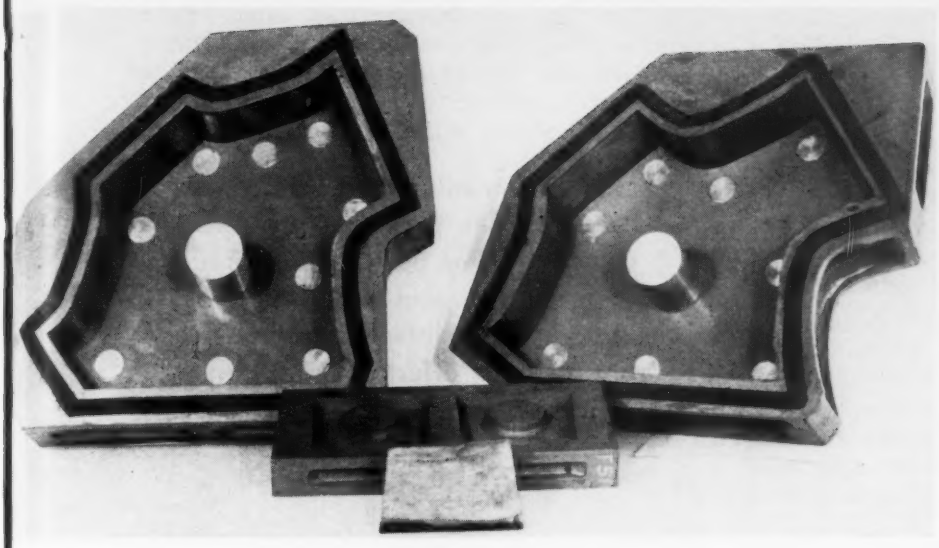
To apply these sheets to a pattern or corebox, both sheet and pattern must be roughed up to obtain an adequate bond. A coat of resin is applied to pattern or sheet, clamped into place and allowed to cure.

A quick method of patching a print or pattern without sheets is to rough up the area to be treated and apply spacers of the required thickness. A coat of resin is then painted on the pattern, a plate clamped on top and the resin allowed to set.

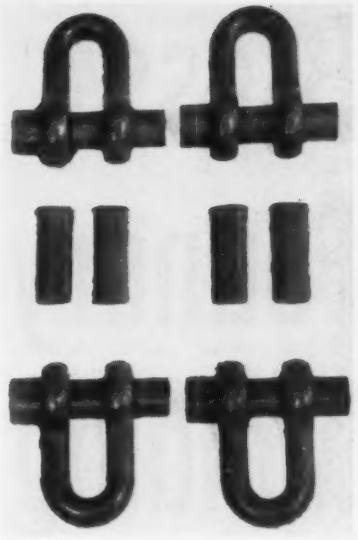
**Plastic Patterns from Sand Molds**—To gain speed and reduce costs in obtaining certain types of patterns, we have been casting plastic in green and skin dried sand molds. (A molding sand of No. 60 fineness is suitable.) Chill patterns, prints and small miscellaneous patterns are ideal for this type of operation. The only slight disadvantage is that the castings require sanding or machining on the cope side.

This method is very fast and surprisingly accurate. A number of small sand molds are rammed up in the small castings department. A coating of plaster-cote is then sprayed on the mold, using 45 psi pressure. This forms a protective coat between the wet sand and the resin. Two coats of blue mold release are sprayed on the molds and allowed to dry, and the molds are ready for casting.

The molds are filled with No. 300 casting resin and laminated with fiber-glass cloth for strength. The resin is allowed to cure overnight, sand is scraped off, and the castings washed in water. If sufficient coats of mold release are added, the release may be peeled off the plastic (mold release is soluble in water).



Completed plastic corebox ready for use



Patterns made in three hours in sand molds

This is undoubtedly the fastest process for reproducing small patterns accurately to size that has been used to date.

**Costs**—During the past year we have substantially reduced the cost of new patterns for production machine work. We have now had plastic patterns and coreboxes in service for a sufficient length of time to evaluate their life.

The following points indicate a substantial saving with plastic equipment:

1. A considerable reduction in cutting and grinding tools in the pattern shop.
2. Cost of some plastic patterns has been reduced to as much as one-eighth the cost of metal.
3. Very fast production of patterns to size.
4. Economic maintenance due to the fast and easy method of repair and build-up.

It should be mentioned that where simple shapes and block patterns are concerned, it is unlikely that plastic will show to advantage. The more intricate the contours become, the more advantageous becomes the use of plastic.

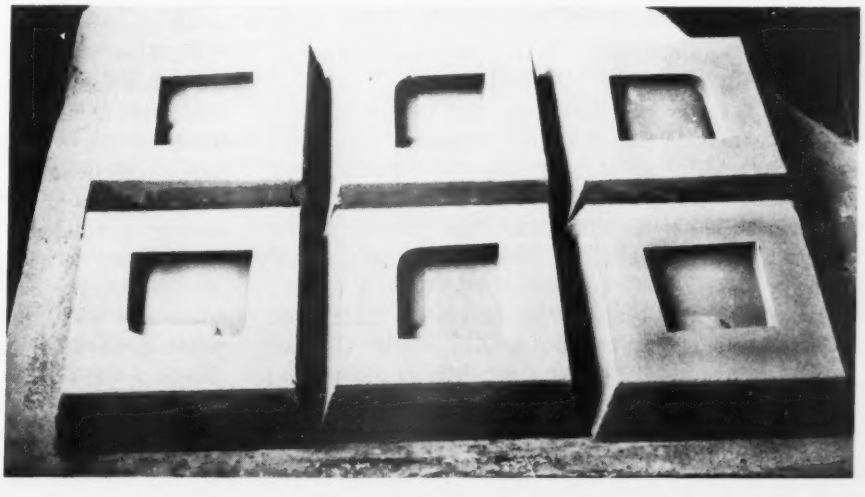
Table I shows some cost comparisons on five pieces of pattern equipment previously made in metal, and recently reproduced in plastic in our shop.

**TABLE I—Comparative Costs of Patterns**

| | ——METAL—— | | ——PLASTIC—— | | |
|---|---|---|---|---|---|
| | Material Cost | Direct Labor | Material Cost | Direct Labor | Approx. Savings |
| Side frame pattern[1] | $280.00 | 600 hours | $488.00 | 150 hours | $1,142 |
| Side frame | | | | | |
| Corebox A | 39.00 | 60 | 70.00 | 11 | 116 |
| Corebox B | 17.00 | 31 | 30.00 | 9 | 53 |
| Corebox C | 10.00 | 16 | 14.00 | 6 | 26 |
| One intricate Pattern[2] | 100.80 | 450 | 11.20 | 50 | 1,289 |
| Total savings for five pieces | | | | | $2,626 |

[1]Aluminum. [2]Brass. Master patterns not included in above costs.

**Conclusions**—New patterns and coreboxes at Canadian Steel Foundries are now almost exclusively produced as plastic equipment. This changeover has reduced pattern shop cost, both in labor and machine tools. We are obtaining better cores with less draft and greater accuracy. Less rapping of boxes has meant reduced pattern shop maintenance. Some patterns and boxes in service for upwards of 75,000 cores have given excellent results as to wear and service.



Green sand molds ready for the pouring of plastic. The method is fast, inexpensive and accurate in making certain types of patterns

# Brass Foundry Molding SANDS

**The seventeenth in Mr. St. John's series on *The Brass Foundry* takes a look at some basic fundamentals of grain size and shape, bonding materials, additives and processing as they affect molding sands**

By HARRY ST. JOHN
*Foundry Consultant*

IN THE foundryman's list of materials, molding sand ranks next in importance to the metal itself. Among general casting methods, molds are made of green sand, baked sand, ceramic compositions and metal. Of these molding materials we are concerned here only with green sand—that is, sand tempered usually with water and bonded with clay or a claylike substance.

Until comparatively recent years molding sands were simply dug out of the ground and used as supplied by nature, without significant change. The clay binder was already mingled with the sand, which required only the addition of water and thorough mixing. The suitability of the sand for brass molding was a matter for the foundryman to judge, usually by "feel."

About forty years ago, molding sands, particularly those intended for use in casting iron and steel, became a subject of scientific study, and equipment was developed for measuring their properties. This development was prompted in part by a growing scarcity of easily accessible sands of satisfactory quality. Freight rates, higher than cost of the sand itself, became a matter of increasing concern to the foundryman. He began to take an interest in blending sands which, taken singly, would not have suited his purpose. This practice has progressed to a point where it is now possible in most foundries to work with a sand of better quality and under closer control than most of the sands now available in natural deposits.

The word "blended" rather than "synthetic" is used advisedly. By synthetic sand is properly meant a natural or manufactured sand free from clay to which clay or other bonding material of selected character has been added in a desired proportion. Such sands, sufficiently fine grained for use in the brass foundry, are not readily or cheaply obtainable. A blended sand is one in which natural sands low in clay have been mixed with each other and with an added bond to obtain desired molding properties.

An ideal molding sand would be one which, properly tempered would conform perfectly to the contours of the pattern in the mold and would hold its shape exactly when exposed to the pressure and heat of molten metal as the mold is filled. In its molded condition it would be sufficiently porous to permit the escape of air and mold gases without restraint, and at the same time would not permit penetration of metal into the sand nor contribute in any way to surface imperfections of the casting. Modern materials and modern methods now make it more nearly possible than ever before to approach this ideal.

The following characteristics of sand are of importance:

1. Size and shape of grains.
2. Bonding qualities and workability of the bond.
3. Freedom from easily fusible components.
4. Freedom from foreign materials, metal particles or unmixed bond which may cause surface defects in the castings.

**Grain Size and Shape**—First of all, the grains should be as nearly round as possible. Sharp, angular grains tend to pack closely, allowing little open space for the passage of gases. Since a certain amount of core sand, much of which is angular, inevitably finds its way into the molding sand, it is particularly important that the base molding sand should consist of round grains.

It has been held that it would be ideal if all of the sand grains were of exactly the same size, as in Fig. 1. If the grains were perfectly round, the

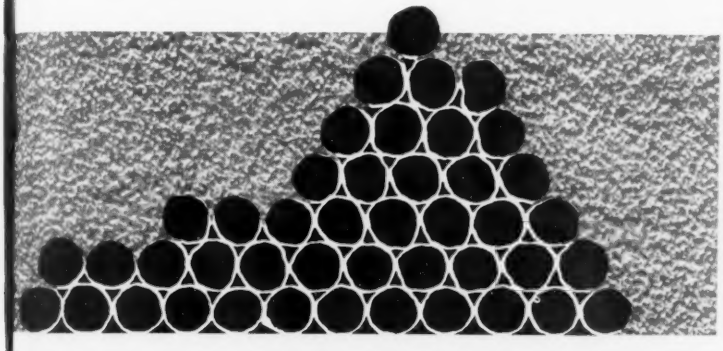


Fig. 1—If all the grains were perfectly round, the permeability of the sand would be at a peak

voids or open space between grains would thus be the maximum possible and permeability would be at a peak. The percentage of voids would be the same regardless of grain size but permeability would be somewhat less with a small grain size because of greater friction opposing the flow of gases. Since a one-screen sand—one in which all grains are of the same size—has not been practically available, three- and four-screen sands have been popular. In these categories the great majority of grains fall into three or four adjacent screen sizes so that as nearly as possible a uniform grain size has been attained.

When we mix sands of varying size we get a rather surprising result with respect to permeability. Adding a fine sand to a coarse one as shown in Fig. 2 at once reduces the permeability by filling in the voids between the coarse grains; but adding a coarse sand to a fine one, as shown in Fig. 3 merely roughens the surface without materially increasing the permeability.

Not until enough coarse sand has been added to make it dominant (about one-third total volume) is there an appreciable increase in permeability. It follows that if we wish to decrease permeability we can readily do so by adding finer grains but if we wish to increase permeability we must do so by subtracting finer material. Otherwise we can accomplish our purpose only by adding so much coarse material as to roughen the casting surface undesirably and increase metal penetration into the sand.

In the brass sands particularly we have also to deal with "fines"—particles so small that they pass through a 200-mesh screen. If these fines are allowed to accumulate, they will fill the voids and seriously reduce permeability. The fines may consist of fine grains of sand or of excess bonding material lying loose between the grains.

One good method of controlling fines is to remove them by air suction during processing of the sand. Suction may well be used for ventilation at the shakeout and at any point where dry sand is screened. An adjustable damper in the exhaust pipe will serve to control the percentage of fines at a desired level. At this point a word of caution. A completely dry sand is very dusty and, in handling to or from storage, causes undesirable working conditions. Whether purchased as such or processed in a dryer, a so-called dry sand should preferably contain between 1 and 2 per cent water.

In the past, brass-sand permeability was usually held between 12 and 20, AFS standard, and this is still not uncommon practice. However, when blended sands are used to attain dimensional precision with very hard molds, the permeability usually is from 25 to 30, or even 35. With very large castings an exceptionally smooth surface is not important and the permeability may go as high as 40. Here, instead of a three- or four-screen sand, we are likely to have a blend, about 50-50 for small castings, of two very different sands. One, a fine sand, as low in clay as can be obtained, with an AFS fineness of about 150; the other a coarser sand, AFS fineness around 100, which must also be of rounded grain, well weathered and almost free from clay. Bentonite is the usual bond. For large castings a larger proportion of the coarse sand is used.

**Bonding Materials**—In natural-bonded sands the bonding material is, of course, the native clay found mixed with the sand. The character of the clay will go far to control the molding properties of the sand, and there is perhaps no better method of determining its character than by judging the results obtained with it. Recent experience, however, has demonstrated that a naturally unsuitable clay can be made more suitable by additions which change its chemical character. Available knowledge on this subject is scanty but important future developments are to be expected.

In synthetic or blended sands a bonding material is added. We are here concerned only with clay or claylike materials such as bentonite. Other bonding agents such as cements, oils and the synthetic resins, have achieved some importance and will be described in a later article devoted to molding methods.

The commonly used added bonds—fire clay, western bentonite and southern bentonite—differ from one another in the properties they impart to molding sand. For example, the highest hot

strength at a temperature around 2000°F is obtainable by blending fire clay with both bentonites. Hot strength is important to the foundryman because it measures the ability of a mold to stand up at molten metal temperatures. Steel, cast at a high temperature, requires a high hot strength. Large castings of any metal need a higher hot strength than small castings.

It is well to remember that an unnecessarily high hot strength increases the cost of removing sand from the castings when they are cleaned. The casting temperature is an important factor. The high-nickel alloys are cast at iron and steel temperatures. For these alloys the blend already mentioned gives the highest hot strength, followed by fire clay, western bentonite and, finally, southern bentonite.

The brasses and bronzes, including alloys with aluminum and silicon, seldom heat an appreciable thickness of the molding sand much above 1500° F. At this temperature southern bentonite has the highest hot strength, followed by western bentonite, the blend of bentonites with fire clay and, lowest of all, fire clay by itself. The foundryman should establish by trial the bond which best suits his particular condition and will often find that a blend of bonds works better than any single one.

**Sand Processing** — The traditional method of tempering and mixing molding sand has been by the use of a sprinkling can and a shovel. The molder's judgment determines when this process is complete. With a combination of natural-bonded sands and a molder who is a good craftsman this works pretty well. The ideal result is a sand in which each grain is thinly coated with moist bond with no excess of either bond or water. With the exception of sand which comes into intimate contact with hot metal, naturally-bonded sand grains retain their coating of bond surprisingly well even when rather dry. This is not true of bentonite-bonded sands. With this type, as the sand dries, the bond tends to shake off from the grains into the voids. Shovel mixing won't put it back. Such a sand when moistened not only lacks strength but also has an impaired permeability because of the loose bond.

In modern practice even the smallest foundry needs mechanical equipment to condition at least a portion of its daily sand requirements, even when a natural-bonded sand is used. One simple procedure, although one which adds something to the molding cost, is to use a facing sand. The facing mixture, which is intended to cover the face of the pattern, is made up in a muller and consists of used sand which has been screened, with as much new sand as may be needed for make-up. To this mixture is added bonding material, water and such additives as may be desired. After a little experience with the use of testing equipment, the properties of the facing mixture can be controlled very precisely. If facing sand is used, the properties of the backing sand, other than permeability, need not be so closely controlled as would otherwise be necessary.

The sand in contact with the pattern must have adequate green strength and must be free from excess moisture, pieces of metal and clay balls. Pellets of brass will be present in used sand unless it has been put through a screen at least as fine as 10-mesh, while complete removal requires 20-mesh. The use of a 20-mesh screen is not practical if the water content of the sand is more than 2 per cent.

The new sand added, particularly if it has a natural bond, will contain little balls of unmixed clay. These balls will be eliminated during the mulling operation. Otherwise, if they are present

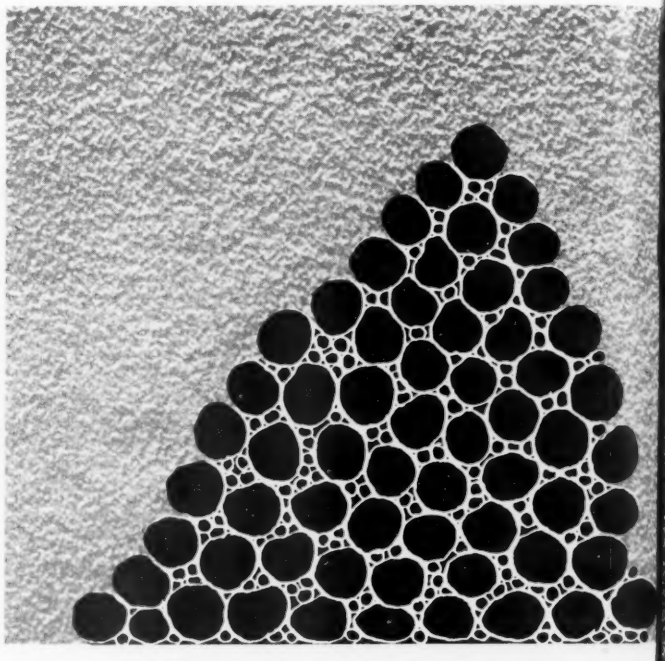


Fig. 2—Adding a fine sand to a coarse one immediately reduces the permeability of the sand

in the mold wall where the metal will strike them, they will cause tiny explosions, resulting in little craters on the surface of the casting. After mulling, the sand will be in a compressed state and will need to be opened up by means of an aerator. Several types are on the market, any of which, properly used, will deliver the sand in a fluffy condition, suitable for molding.

The above procedure is an ideal method for supplying the daily need for new sand which has been lost in one way or another. In a large, elaborate sand system a similar practice will be used except that, instead of a special facing sand, all of the sand can be of facing-sand quality. This involves an investment for mechanized equipment beyond the reach of the average small foundry. Varying degrees of labor-saving mechanization are possible and a large variety of equipment for that purpose is available.

For small castings in the brass foundry a well-prepared natural-bonded sand will have a compression strength of 6 to 8 psi, a permeability of 15 to 20, a moisture content of 6.0 to 6.5 per cent.

A blended sand with bentonite bond should have a strength of 12 to 15 psi, a permeability of 25 to 35, a moisture content of 3.5 to 4.0 per cent.

In the use of these sands the hardness of the mold is a factor. The natural-bonded sand, weaker and less permeable, should be molded to a hardness of 70 to 75, while the bentonite-bonded sand works best at a mold hardness of 90 to 95. For castings weighing several hundred pounds or more the strong sand is very suitable while the weaker sand must be reinforced with nails or otherwise.

Care must be taken to avoid "hot sand" at the molder's bench. Molding sand at a temperature much above 100°F will not separate readily from the pattern unless the pattern in turn has been heated to a higher temperature. This difficulty is not likely to be encountered with facing sand which has been thoroughly conditioned before use but, in general, the supply of sand should be such that the same sand is not used more than twice during the day.

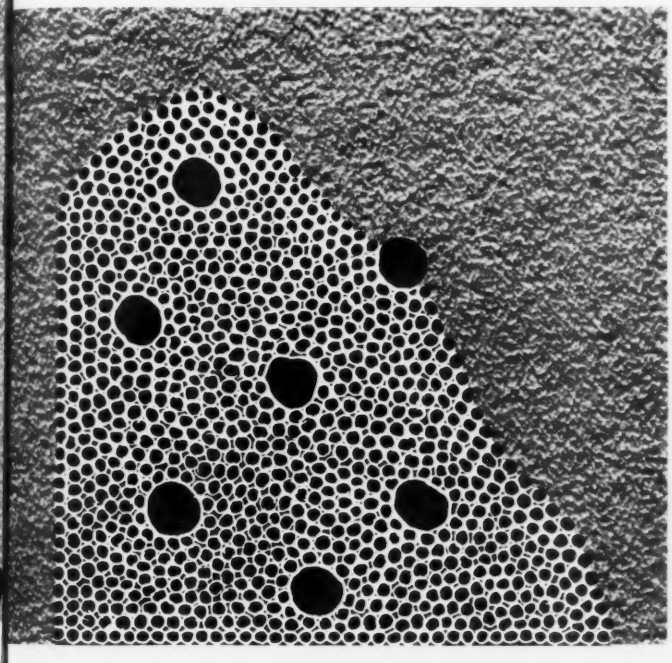


Fig. 3—Adding coarse sand to fine sand roughens the surface without increasing its permeability

**Additives**—In a well made mold, sufficiently compact to prevent metal penetration, the tendency of the mold face to expand when heated is a serious matter, since expansion is likely to rupture the surface of the mold and cause scabs and buckles. These defects can be almost entirely avoided by incorporating 1 or 2 per cent of flour in the facing mix. Originally a cereal flour was recommended but it has been found that wood flour is practically as effective. This is one additive which can be universally used without fear of unpleasant consequences.

Other additives which have been suggested are in a somewhat adolescent stage. It is known, for example, that the chemical character of the clay bond plays an important part in the workability of the molding sand mixture. It is impossible to discuss this without introducing the highly technical subject of the relative acid and basic properties of the sand, measured by what is called its hydrogen potential or pH. At pH 7.0 the sand is neutral, at lower values it is acid, at higher values of pH it is alkaline.

Most molding sands are on the acid side, and some of their properties can be improved by increasing their pH. This can be done by including a solution of sodium carbonate in the water added for tempering. The amount of carbonate to be added ranges downward from 0.5 per cent. This is not a general practice and is mentioned here simply to illustrate that the future holds a wide range of possibilities in the use of chemical additives to alter and control molding sand properties. A number of other additives have been suggested and tried experimentally. For the present the average brass foundryman should be content to keep informed about developments in this field.

By far the greater part of the molding sand in use has a base of silica grains. There are other possibilities. Silica-base sand has many advantages, few disadvantages, but in some regions it is not readily obtainable. Olivine, a compound silicate of magnesium and iron, contains little or no free silica and thus avoids any danger of silicosis. A possibility of the future, it is found in quantity on the Pacific coast, is now used extensively in Norway for molds for iron and steel.

Zircon, a silicate of the metal zirconium, is costly but has several favorable properties. It is widely used in iron and steel facing sands and has found some application in cores for brass and bronze.

A usable molding sand can be made from crushed fire brick. As deposits of sand now in use become exhausted, some of these and a number of other refractory materials are likely to become better known to the foundryman.

As foundry mechanization progresses, large foundries are making increasing use of sand technology in conditioning systems which are nearly automatic. Smaller foundries, which include most of those casting brass and bronze, cannot make economical use of full mechanization but can still apply the same principles of control in the mixing of facing sand. To the writer this seems the best policy for them to follow. Individual sand heaps, whether on the floor or in overhead chutes, can be continuously enriched by mixing a portion of each, under controlled conditions, with new sand and such additives as wood flour. If used as facing this sand will give as good results as that delivered by the most costly mechanical system.

For a more detailed understanding of the standards now in general use and the testing equipment available for maintaining those standards the reader is referred to the 1952 edition of the *Foundry Sand Handbook* published by the American Foundrymen's Society. Harry W. Dietert's 1954 Hoyt lecture on "Processing Molding Sand", published by the American Foundrymen's Society, should also be in the foundryman's library.

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# Vacuum Treating Nonferrous Melts

## *At the U.S. Naval Gun Factory*

**Two production units for vacuum treating nonferrous melts are in use at the Naval Gun Factory. The smaller treats 200 lb of aluminum or 600 of bronze; the larger treats 600 lb of aluminum or 1800 of bronze**

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By VINCENT DePIERRE AND SHINGO INOUYE
*Metallurgists*
U. S. Naval Gun Factory, Washington

THE Naval Gun Factory has two production units for vacuum treating nonferrous melts for sand castings and forging ingots. The first unit, installed in September, 1954, is shown in Fig. 1. This unit is a duplicate of the unit developed at the Naval Research Laboratory. It can be used to vacuum treat up to 200 pounds of aluminum alloy melts or 600 pounds of bronze melts. It is the first production installation of the vacuum treating process developed by the Naval Research Laboratory. (See FOUNDRY, December, 1954, p. 74 and AFS *Transactions*, 1955, p. 345.)

Great improvements in soundness and mechanical properties were obtained in castings and ingots poured from vacuum-treated nonferrous melts. Therefore, in October, 1955, a larger vacuum treating unit was installed in the Naval Gun Factory. This unit, shown in Figs. 2, 3 and 4, is used to vacuum treat up to 600 pounds of aluminum alloys or 1800 pounds of bronze.

**Vacuum Treating Equipment**—Equipment at the Naval Gun Factory consists of the following for each vacuum unit: Small unit (Fig. 1)—one 5-hp, two-stage, Kinney mechanical pump; one vacuum

**TABLE I—Tension Test Results on Aluminum Alloy Sand Castings**

| Alloy | Heat No. | No Treatment | | | | Vacuum Treatment | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Tensile Strength psi | Yield[1] Strength psi | Elong. in 2 inches % | Per Cent Porosity | Tensile Strength psi | Yield[1] Strength psi | Elong. in 2 inches % | Per Cent Porosity |
| 43 No Ti | 29D513 | 18,500 | 8,250 | 11.0 | 1.62 | 18,500 | 8,250 | 11.5 | 0.96 |
| | | 18,500 | 8,000 | 11.0 | 1.69 | 18,500 | 8,000 | 9.8 | 0.92 |
| 43 No Ti | 28D512 | 15,500 | 9,000 | 6.5 | 2.60 | 18,240 | 11,700 | 9.4 | 0.74 |
| | | 15,550 | 8,300 | 8.5 | 2.60 | 17,900 | 10,000 | 11.0 | 0.78 |
| 43 No Ti | 29D51 | 16,650 | 10,850 | 10.5 | 2.68 | 17,400 | 9,400 | 10.0 | 0.89 |
| | | 16,700 | 8,600 | 11.0 | 2.53 | 17,300 | 8,850 | 9.5 | 0.74 |
| 43 + .1% Ti | 29D513 | 19,000 | 8,250 | 11.5 | 2.13 | 19,500 | 8,500 | 11.0 | 0.78 |
| | | 19,000 | 8,750 | 10.0 | 1.96 | 19,250 | 8,500 | 11.0 | 0.85 |
| 43 + .1% Ti | 28D512 | 17,900 | 8,250 | 12.5 | 1.49 | 19,000 | 10,450 | 13.5 | 0.15 |
| | | 17,700 | 9,250 | 11.5 | 1.52 | 20,000 | 11,550 | 17.0 | 0.15 |
| 43 + .1% Ti | 29D51 | 17,700 | 10,300 | 10.0 | 1.49 | 17,100 | 10,400 | 7.0 | 0.04 |
| | | 17,350 | 11,300 | 9.5 | 1.52 | 18,350 | 10,300 | 10.0 | 0.22 |
| 195T4 | 2B66 | 33,000 | ..... | 8.0 | ... | 40,000 | ..... | 13.0 | ... |
| | | 32,500 | ..... | 6.0 | ... | 41,000 | ..... | 13.5 | ... |
| 195T4 | 8B64 | 35,000 | ..... | 8.0 | 1.28 | 40,500 | ..... | 13.0 | 0.38 |
| | | 29,000 | ..... | 7.0 | ... | 38,500 | ..... | 12.5 | ... |
| 195T4 | 8B65 | 33,500 | ..... | 7.0 | 1.51 | 40,000 | ..... | 14.0 | 0.18 |
| | | 30,500 | ..... | 6.0 | ... | 34,000 | ..... | 7.5 | ... |
| 356T4 | 10B65 | 22,000 | ..... | 3.0 | 2.77 | 26,500 | ..... | 3.0 | 0.75 |
| | | 22,500 | ..... | 2.5 | ... | 26,500 | ..... | 3.0 | ... |
| 356T4 | 10B66 | 25,000 | ..... | 3.5 | 1.91 | 27,500 | ..... | 3.0 | 0.23 |
| | | 24,000 | ..... | 3.0 | ... | 27,500 | ..... | 3.5 | ... |
| 356T4 | 10B67 | 23,500 | ..... | 3.0 | 2.20 | 26,500 | ..... | 3.0 | 0.37 |
| | | 24,000 | ..... | 2.5 | ... | 26,000 | ..... | 3.0 | ... |
| Almag 35 | 9B62 | 31,000 | 17,500 | 9.5 | 3.31 | 35,000 | 18,000 | 10.0 | 0.04 |
| | | 30,500 | 17,500 | 9.5 | ... | 35,000 | 18,500 | 9.5 | ... |
| Almag 35 | 9B63 | 31,500 | 18,000 | 9.5 | 2.53 | 37,000 | 19,000 | 9.0 | 0.54 |
| | | 32,000 | 18,000 | 9.5 | ... | 35,500 | 19,500 | 9.0 | ... |
| Almag 35 | 9B64 | 31,000 | 17,500 | 9.5 | 3.79 | 36,000 | 18,500 | 10.5 | 0.37 |
| | | 30,500 | 17,500 | 9.5 | ... | 37,000 | 19,000 | 10.5 | ... |

[1]Yield Strength = 0.005 in. per in. elongation under load for Alloy 43 and 0.00375 in. per in. elongation under load for Almag 35.

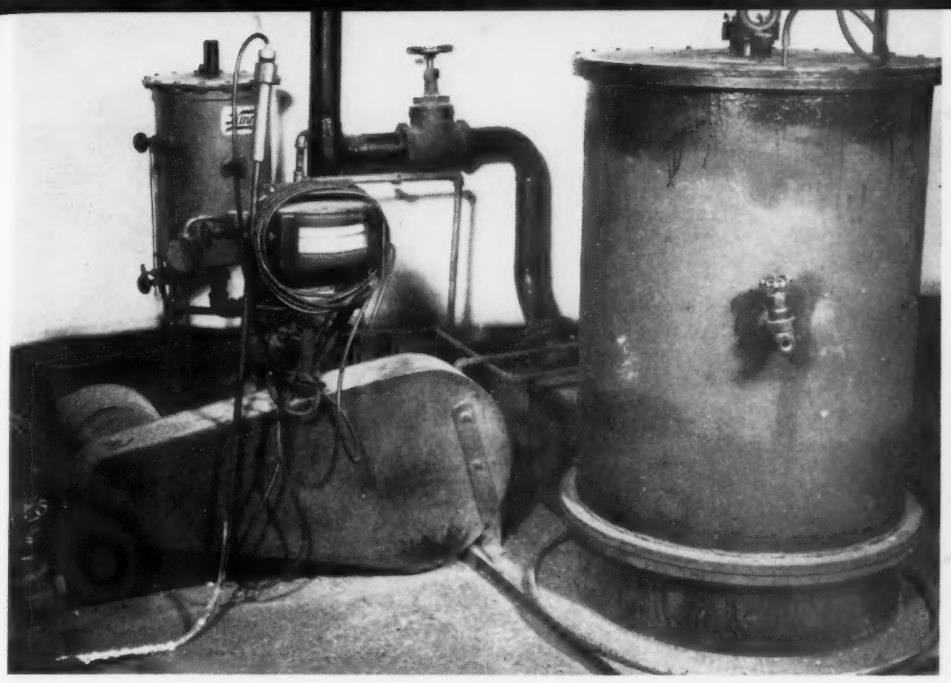

Fig. 1—200-lb vacuum degassing unit in operating position. Note pyrometer and thermocouple location

chamber, 30 in. in diam and 48 in. high, made from ¼-in.-thick mild steel plate; and a Stokes McLeod pressure gage (Flosdorf type, 0-500 microns). Large unit (Figs. 2, 3 and 4)—two 5-hp, two-stage mechanical pumps; one vacuum chamber, 29¾ in. wide, 38½ in. high and 6½ ft long, made from ¼-in.-thick mild steel plate; and a Stokes McLeod gage (Flosdorf type, 0.-500 microns).

Vacuum chambers of both units consist of two parts—an upper part and a base. The upper parts are lifted from and replaced on the bases by an overhead crane, and are sealed in place by a neoprene rubber gasket. Atmospheric pressure and the weight of the upper part maintain the seal at the joint during vacuum treating. No bolting is used on the vacuum chamber parts.

Life of the neoprene gasket varies with type of alloy treated and continuity of treatments. The gasket service life is about 100 melts for continuous treatment of aluminum alloys, about 300 melts for intermittent treatment of aluminum alloys, about 50 melts for continuous treatment of copper-base alloys and about 100 melts for intermittent treatment of copper-base alloys.

In both units the amount of vacuum obtained in the vacuum chambers depends on the tightness of the joints and the alloy being treated. Without any melt in the units the pressure is reduced to about 40 microns (.040mm) by the mechanical pumps in approximately 10 minutes. During vacuum treating of molten aluminum alloys and bronzes the pressure is reduced to 50-100 microns (.05-.1mm) and 275-325 microns (.275-.325mm), respectively.

Between the pumps and the vacuum chamber of each unit is a water-cooled cold trap which condenses elements distilled from the melt under low pressures. Zinc and lead are lost from vacuum-treated melts; the per cent loss by distillation depends on the original amount in the melt, the melt size and temperature, chamber pressure and time of vacuum treatment. A manually controlled valve between the pump and chamber regulates rate of evacuating air from the chamber.

The small unit has one quartz sight glass in the top of its vacuum chamber and the large unit has three. These glasses are used for observation of the action of the melt during vacuum treating.

Each vacuum chamber has a Stokes McLeod gage for measuring pressures within the chambers and an inlet valve for allowing air to enter the chamber after vacuum treatment has been completed.

**Vacuum Treating Procedure** — Melts scheduled for vacuum treatment are melted by normal melting procedures in silicon-carbide and graphite crucibles in gas-fired furnaces. The only change in melting procedures is superheating to compensate for temperature losses during vacuum treatment. Superheat above pouring temperatures for the various alloys at the Naval Gun Factory are 100°F for aluminum alloys, 200°F for bronzes and 200°F for nickel-base alloys.

For vacuum treating, the top part of the chamber is removed from the base by overhead crane. The hot crucible with superheated molten metal is placed on the silicon carbide refractory stool in the base. The top part is then lowered onto the base and the inlet valve on the vacuum chamber is manually closed.

The valve between the vacuum pump and vacuum chamber is slowly opened manually. Within a minute or two, a boil is observed on the melt surface through the sight glass as the air pressure in the chamber is reduced. The operator controls the boiling action of the melt by the valve. For aluminum alloys the valve is usually opened completely without any likelihood of molten metal boiling over the top of the crucible. For bronzes and nickel-base alloys the valve is opened carefully; a too rapid reduction of pressure causes highly gassed melts to boil over the crucible edge.

After the valve is completely open, aluminum alloys are allowed to stay 10 minutes under vacu-

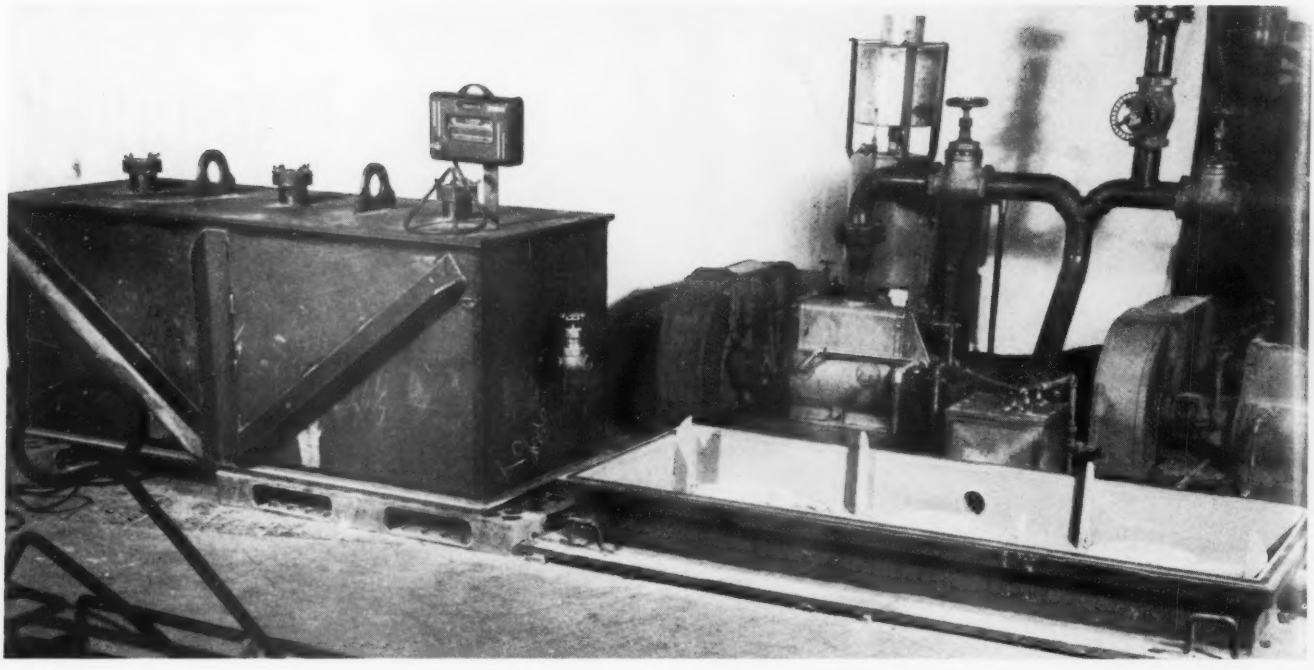

Fig. 2—600-lb vacuum degassing unit with chamber opened. Note the pressure gage and the sight ports on top of the chamber cover

um; bronzes and nickel base alloys are held 5 minutes. By this time the boiling action has ceased and the surface of the melt is quiet. The valve between pump and chamber is then closed. The air inlet valve is opened. The upper part of the vacuum chamber is raised and the crucible is then removed for pouring of castings.

Aluminum alloy melts weighing up to 200 lb and 700 lb (three crucibles) have been vacuum treated in the (small and large vacuum treating units, respectively. Bronzes and nickel-base alloys weighing up to 600 lb have been treated in the small unit. Between operations the vacuum pump is kept running.

At the end of the working day the vacuum chamber is evacuated by the vacuum pump. The pump is then stopped. The next day the pump is started at least ½-hour before any vacuum treating operation. If the next work day is over a week-end or holiday, the pump is started at least 1½ hours before any vacuum treating operation. This procedure has been found to insure removal of moisture from the vacuum chamber and to obtain lowest pressure values in the chamber during treating operations.

**Test Procedures and Results**

1. *Aluminum Alloys*—The vacuum treatment of melts was first tried at the Naval Gun Factory on aluminum alloys for castings and forging ingots. The following aluminum alloys have been and are being vacuum treated there:

| Government Specifications | Commercial Designation |
|---|---|
| *Casting Alloys* | |
| Fed. Spec. QQ-A-601a Composition 2 | 43 |
| Fed. Spec. QQ-A-601a Composition 4 | 195 |
| Fed. Spec. QQ-A-601a Composition 11 | 220 |
| Fed. Spec. QQ-A-601a Composition 3 | 356 |
| Mil. Spec. MIL-A-10936(Ord.) | Almag 35 |
| *Forging Alloys* | |
| Navy Dept. Spec. 46A7e Class 8 | 53S |
| Fed. Spec. QQ-A-367 Comp. 5 | 14S |
| Fed. Spec. QQ-A-367 Comp. 10 | 75S |
| Fed. Spec. QQ-A-367 Comp. 11 | 61S |

Vacuum treatment of alloys has resulted in a significant decrease in porosity, as seen in Fig. 5. The radiographs of Fig. 5 were made of sand castings (Fig. 6) poured from the same melt before and after vacuum treating.

Further evaluation tests of vacuum treating were made on aluminum casting alloy melts. The alloys were melted by usual Naval Gun Factory procedures in gas-fired crucible furnaces. Then tension test bar castings and step castings (Fig. 6) were poured from each melt. The crucible with excess melt was replaced in the gas-fired furnaces and superheated 100°F above pouring temperature (1400°F). The melt was then vacuum treated and then poured to make tension test bars and step castings. Tension tests and soundness measurements were made on these castings. Table I gives tension test results and per cent porosities of tension test bars without treatment and with vacuum treatment. X-ray tests made of the step castings showed the same general condition shown in Fig. 5 for all the casting alloys.

The following formula was used to calculate the per cent porosities listed for aluminum alloys in Table I:

$$\text{Per cent porosity} = 100\ (D_c - D_r) \div D_c$$

Where $D_c$ = density of a chill cast specimen, $D_r$ = density of sand cast specimen.

The sand cast specimens were pieces cut from the ends of broken tensile test bars. The chill cast

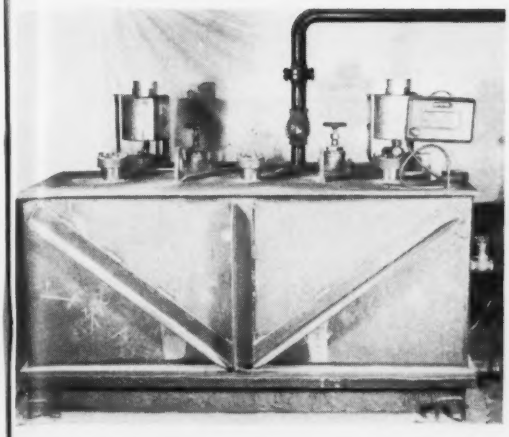

Fig. 3—The 600-lb vacuum degassing unit is in the operating position

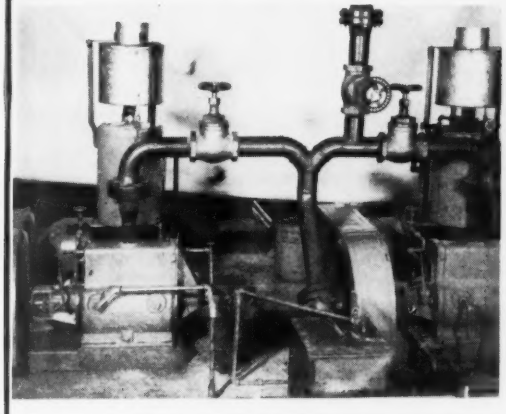

Fig. 4—View of the pumping system for the 600-lb vacuum degassing unit shows condensation box and dual pump

**TABLE II—Tensile Properties from Fig. 10B Separately Cast Bars of Bearing Bronze MIL-B-16261 Grade II[1]**

| Melting Procedure | Tensile Strength psi | | Elongation in 2 in., % | |
|---|---|---|---|---|
| | Average | Range | Average | Range |
| Procedure (No degassing) | Less than 25000 | — | Less than 8 | — |
| Procedure (Oxidation & reduction) | 33,750 | 23000-47000 | 20.9 | 5-42 |
| Procedure (Vacuum treated) | 45,000 | 40000-49000 | 31.7 | 22.5-39.0 |

[1]Specification requirements: Tensile strength psi = 25,000 (min.). Elongation in 2 in. % = 8.0 (min.).

**TABLE III—Tensile Properties[1] of Fig. 10B Separately Cast Bars of Silicon Bronze N.D.S. 46B28a Class B.**

| Heat No. | Before Vacum Treating | | After Vacuum Treating | |
|---|---|---|---|---|
| | Tensile Strength, psi | Elongation in 2 in., % | Tensile Strength, psi | Elongation in 2 in., % |
| 29B68[2] | 39,000 | 23.5 | 55,000 | 53.5 |
| 29B69[2] | 45,000 | 51.0 | 54,500 | 52.5 |
| 2C65[3] | 39,000 | 24.0 | 47,000 | 36.0 |
| 2C66[3] | 40,000 | 27.5 | 43,000 | 37.0 |

[1]Specification requirements: Tensile strength (psi) = 45,000 (min.). Elongation in 2 in., % = 15.0 (min.). [2]Silicon bronze 95 Cu and 5 Si. [3]Silicon bronze 95.5 Cu, 3.3 Si and 1.2 Fe.

**TABLE IV—Tensile Properties[1] of Fig. 10B Separately Cast Bars of Gun Metal (88 Cu, 9 Sn, 3Zn) MIL-M-16576 Grade A Made from Vacuum Treated and other Types of Melts.**

| Melting Procedures | Tensile Properties | | | |
|---|---|---|---|---|
| | Tensile Strength psi | | Elongation in 2 in., % | |
| | Average | Range | Average | Range |
| New metals (no degassing treatment) (223 melts) | 44,890 | 30,000-54,000 | 35.0 | 10.0-66.0 |
| New metals (Oxidation & reduction degassing) (100 melts) | 51,880 | 47,000-56,000 | 64.4 | 47.5-79.5 |
| New metals (vacuum treated) | | | | |
| Heat No. 2964 | 55,000 | — | 45.5 | — |
| Heat No. 2965 | 55,000 | — | 39.0 | — |
| Heat No. 2966 | 54,000 | — | 38.0 | — |

[1]Specification requirements: Tensile strength psi = 40,000 (min.). Elongation in 2 in., % = 20.0 (min.)

specimen was poured from the same melts as the tensile test specimens after vacuum treating into graphite molds (3 in. long and ½-in. round). Density of the chill cast specimen was assumed to be the maximum density of sound alloy obtainable from the melt.

Aluminum alloy forging ingots weighing about 700 lb are made in the Naval Gun Factory for producing ordnance forgings. Ingots made from melts without vacuum treatment were full of pinhole porosity as shown by ultrasonic testing, while ingots made with vacuum treated melts were sound.

2. *Copper*—Copper sand castings were made from melts with and without vacuum treating. Very little difference was found in tension test results and soundness of test bars poured from melts before and after vacuum treating. Tensile test results are listed below:

| Before Treating | | After Vacuum Treating | |
|---|---|---|---|
| Tensile Strength psi | Elongation in 2 in. % | Tensile Strength psi | Elongation in 2 in. % |
| 22,500 | 47.0 | 26,000 | 47.0 |
| 22,000 | 48.0 | 25,000 | 45.0 |

A big difference in soundness of step castings (Fig. 6) poured from the same copper melt was found by x-ray examination. Fig. 7 shows cross-sections of these step castings.

A 300-lb copper forging ingot was poured from a copper melt which was degassed by vacuum treating. Examination of sections showed the ingot to be free from blowholes and porosity customarily found in copper forging ingots previously made in the Naval Gun Factory.

3. *Bronzes*—The following bronzes have been subjected to vacuum treatment in the molten state at the Naval Gun Factory: Bearing bronze MIL-B-16261 Grade II (83.5 Cu, 8 Sn, 8 Pb, 0.5 P), Silicon bronze N.D.S. 46B28a Class B (95 Cu, 5 Si and 95.5 Cu, 3.3 Si, 1.2 Fe), Gun metal MIL-M-16576 (88 Cu, 9 Sn, 3 Zn).

Vacuum treating of all bearing bronze (MIL-B-16261 Grade II) melts now is standard procedure in the Naval Gun Factory. A comparison of tensile test results on production melts of this bronze made by different melting procedures demonstrates the beneficial effects of vacuum treat-

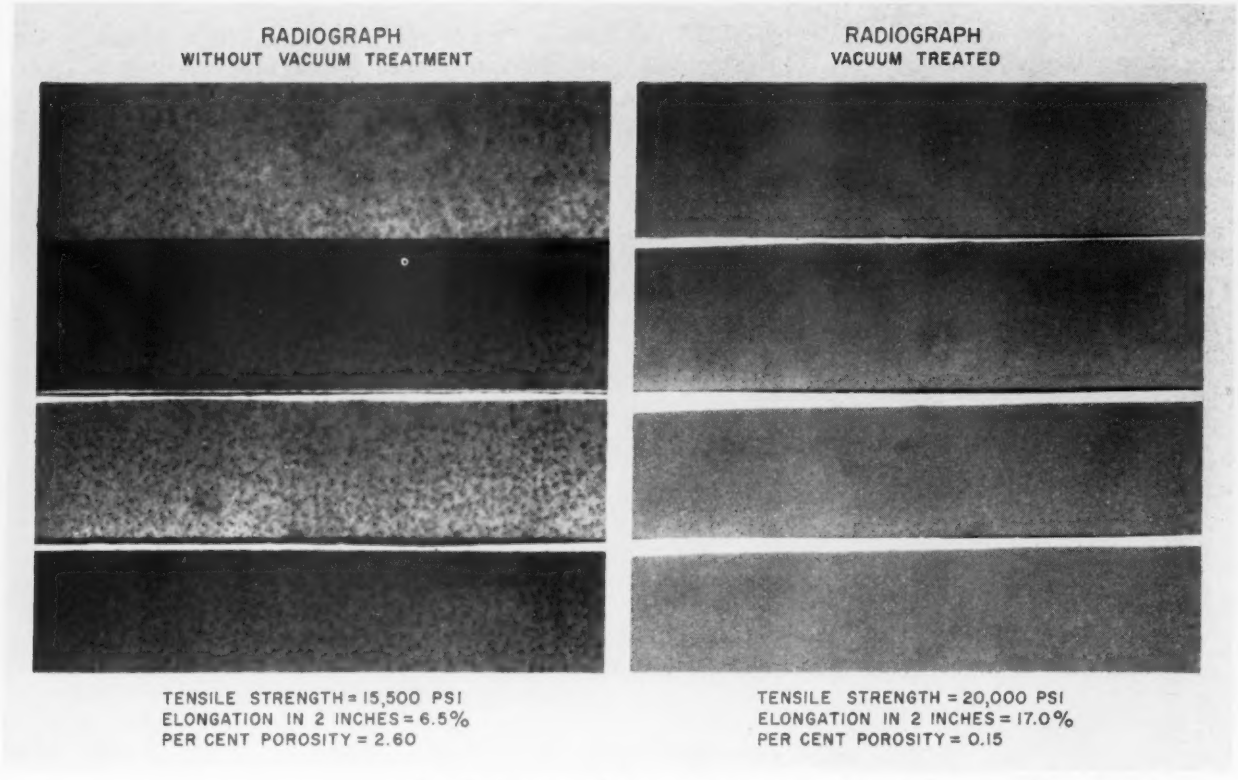


Fig. 5—Micrographs show soundness and tension test results of sand-cast aluminum alloy (43) made with and without the vacuum treatment

ing on the metal quality of this particular alloy.

The following are melting procedures for bearing bronze MIL-B-16261 Grade II:

*Procedure 1—No Degassing Treatment*

1A. For New Metal. First, 75 per cent of the copper is charged into a crucible and melted. No cover is used on the melt. Remainder of copper is added and melted. Lead and tin are added and stirred. 0.5 per cent phosphor as phosphor copper (10 per cent P) is added five minutes before pouring. Melt is heated to pouring temperature and the crucible immediately removed from the furnace for pouring.

1B. For New Metals and Scrap. Copper is charged into a crucible. No cover is used on the melt. Lead, tin and scrap are added in the order named, melted and stirred. 0.5 per cent phosphor as phosphor copper (10 per cent P) is added five minutes before pouring. Melt is then heated to pouring temperature and the crucible immediately removed from the furnace for pouring.

1C. For Scrap. Scrap is charged into a crucible and is melted with no cover. Melt is heated to pouring temperature and crucible is immediately removed from furnace for pouring.

*Procedure 2—Oxidation and Reduction Degassing*

2A. For New Metals. Melting procedure is same as procedure 1A except 1 lb cupric oxide per 100 lb of copper is charged with copper into the crucible and melted before any additions are made.

2B. For New Metals and Scrap. Melting procedure is the same as procedure 1B except 1 lb cupric oxide per 100 lb of copper is charged with copper into the crucible and melted before any of the additions to the melt are made.

2C. For Scrap. Melting procedure is same as procedure 1C.

*Procedure 3—Vacuum Degassing Treatment*

Procedures for new metals, new metals plus scrap, and scrap are the same as procedure 1A, 1B, and 1C, respectively, except that melt is superheated to 2150°F before removing crucible from the furnace. Superheated melt is then vacuum treated before pouring. An extra 0.5 per cent lead is added to and mixed into the melt after vacuum treating to compensate for lead losses due to lead volatilization during vacuum treating.

Table II shows the tensile test properties obtained by the three melting procedures. Procedure 1 gave very inconsistent results, the major portion of melts having tensile properties below 25,000 psi tensile strength and 8 per cent elongation.

Procedure 2 gave properties which varied with raw materials used. Procedure 2A (new metals) gave properties at the higher end of range in Table II, procedure 2C (scrap) gave properties at the lower end of the range and procedure 2B gave intermediate properties.

Procedure 3 gives the highest and most consistent tensile properties. No significant difference in tensile properties was noted for variations in raw materials.

The improvement in metal quality indicated by the tensile test results was also shown in the castings poured from vacuum-treated melts. Sounder castings and more uniform lead distribution were obtained from vacuum-treated melts than from

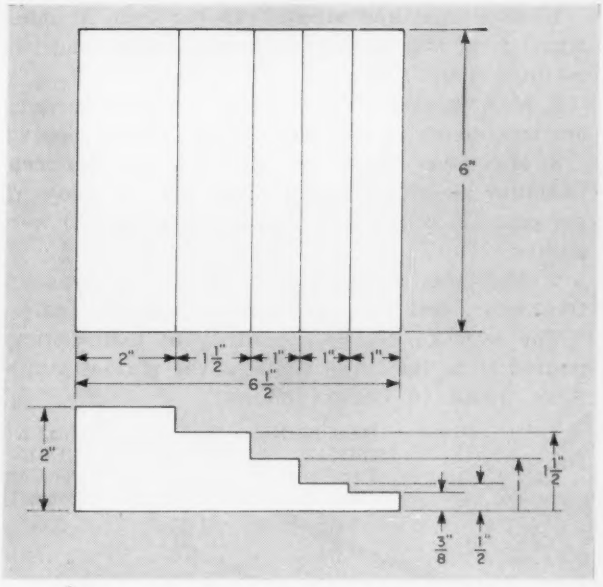


Fig. 6—Dimensions of step castings in Fig. 7

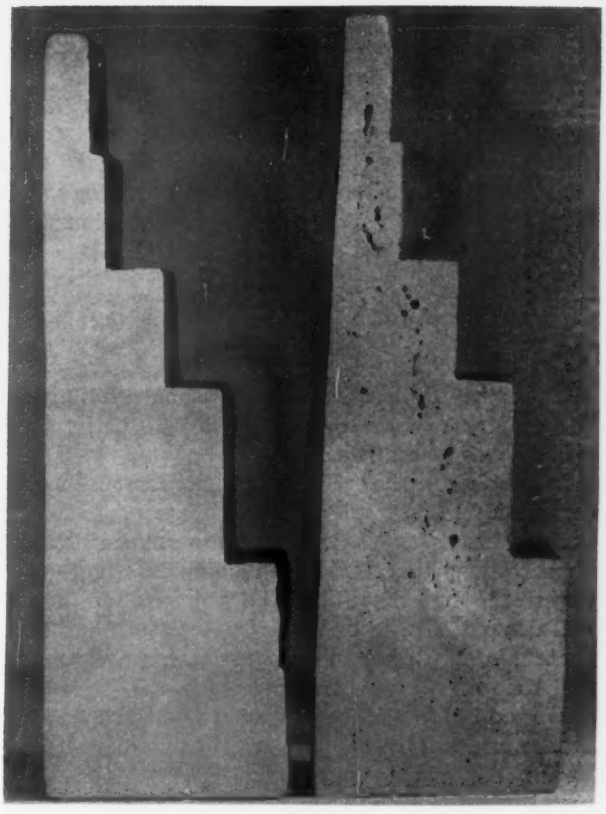

Fig. 7—Cross sections of copper step castings poured from the same melt. Left, after vacuum treatment and right, before the treatment

melts produced without vacuum treatment.

Silicon bronzes (95 Cu, 5 Si and 95.5 Cu, 3.3 Si, 1.2 Fe) melts have also been vacuum treated. Table III shows tensile test results obtained on test bars poured from the same silicon bronze melts before and after vacuum treating. Again a significant increase in metal quality has been produced by vacuum treating.

Gun metal (88 Cu, 9 Sn, 3 Zn) melts have also been vacuum treated. Three 100-lb melts of gun metal were made by the following procedure:

a. Copper and tin were melted in a crucible.
b. The melt was vacuum treated.
c. Crucible was replaced in gas-fired furnace.
d. Zinc was added.
e. Four ounces of phosphor copper (10 per cent P) per 100 lb of melt were added before pouring.

Tensile test results obtained from these melts are listed and compared with results from other melting procedures in Table IV.

Aluminum-nickel bronze (82.5 Cu, 10.5 Al, 3.5 Ni and 3.5 Fe) (MIL-B-16033 Class 4) melts were also subjected to vacuum treating and tension tests made to determine the effect of the treatment. Since this alloy is generally sound when produced under regular Naval Gun Factory procedures, no large differences were expected between tensile properties of castings made from regular melts and vacuum-treated melts. Results in Table V show a very slight improvement in tensile properties of vacuum-treated aluminum-nickel bronze castings.

4. *Nickel Base Alloys*—Preliminary tests have been made at the Naval Gun Factory on vacuum treating the following nickel-base alloys: MIL-N-20164 (66 Ni, 31 Cu, 1.5 Si, 1.5 Fe), MIL-N-20165 Class A (65 Ni, 30 Cu, 3 Si, 1.5 Fe, .5 Mn), MIL-N-20165 Class B (63.5 Ni, 29.5 Cu, 4.25 Si, 2.25 Fe, .5 Mn).

Table VI shows tensile test results obtained on keel type test bars poured from the same melts

**TABLE V—Tensile Properties of Aluminum-Nickel Bronze Sand Castings (MIL-B-16033 Class 4 as Cast) (82.5 Cu, 10.5 Al, 3.5 Ni, 3.5 Fe)**

| Heat No. | No Treatment | | | Vacuum Treated | | |
|---|---|---|---|---|---|---|
| | Tensile Strength psi[1] | Yield Strength psi[1, 2] | Elong. in 2 in., %[1] | Tensile Strength psi[1] | Yield Strength psi[1, 2] | Elong. in 2 in., % |
| 6D61 | 90,500 | 40,500 | 9.0 | 92,500 | 41,000 | 10.5 |
| | 88,000 | 41,000 | 7.0 | 93,000 | 40,000 | 10.0 |
| 6D62 | 79,000 | 40,000 | 5.5 | 90,000 | 40,000 | 7.5 |
| | 86,000 | 40,000 | 7.0 | 93,000 | 41,000 | 10.0 |
| 6D63 | 92,500 | 38,000 | 10.0 | 93,000 | 37,500 | 13.0 |
| | 89,000 | 38,000 | 9.5 | 90,000 | 37,500 | 12.0 |

[1]Requirements: Tensile strength psi = 90,000 (min.). Yield strength psi — 40,000 (min.). Elongation in 2 in., % = 6 (min.). [2]Yield strength measured by extension under load 0.005 in. per in.

before and after vacuum treating. Vacuum treating of the nickel-base alloy melts shows a significant increase in tensile properties.

**Discussion of Results**—Use of the vacuum treating procedure for removing dissolved gases from nonferrous melts at the Naval Gun Factory has resulted in the production of sounder castings and ingots. Results indicated that the procedure is applicable to the following metals and alloys for removing dissolved gases:

1. Aluminum and aluminum alloys
2. Copper and probably nickel
3. Silicon bronzes
4. Copper-tin bronzes with or without lead, nickel and zinc
5. Nickel-base alloys

In applying the process to nonferrous melts containing lead or zinc, it is necessary to make final additions of these metals to compensate for vaporization losses under vacuum treating. Our experience indicates that the vaporization losses will depend on size of melt, original lead and zinc content of melt, pressure in the vacuum chamber, and time of vacuum treating.

We add 0.5 per cent lead to vacuum-treated bronze melts (100-600 lb) with nominal composition of 83.5 Cu, 8 Pb, 8 Sn, .5 P. For 100-lb gun metal melts (88 Cu, 9 Sn, 3 Zn) an addition of 1 lb of zinc after vacuum treating was found to be adequate. Investigations are still being conducted on zinc losses and additions necessary for zinc bearing copper-tin bronzes.

To produce high-quality castings it is necessary that the two major casting variables—melt quality and mold conditions—be controlled. Vacuum treating consistently improves the melt quality of nonferrous melts which contain dissolved gases. However, vacuum treating cannot compensate for poor molding practices.

Experience indicates that the major source of gasses in nonferrous melts is the raw materials (ingots, metal additions and master alloys) used for melting. An example of effect of gases in raw materials is demonstrated in Table I for aluminum alloy 43 with and without titanium additions. The three melts (29D513, 28D512, 29D51) of alloy 43 listed in Table I were made as follows:

1. Aluminum and silicon (95 per cent Al minimum) were melted to desired composition and test castings (No. 1) poured.
2. Melt was then reheated and subjected to vacuum treatment; test castings (No. 2) were poured.
3. Melt was again reheated and 0.1 per cent titanium as aluminum-titanium master alloy (5 per cent Ti) was added; test castings (No. 3) were poured.
4. Melt was reheated and subjected to vacuum treatment; test castings (No. 4) were poured.

The average per cent porosity of test castings poured from the three melts at the various stages were found to be as follows:

| Test Casting No. | Heat No. 29D513 Per Cent Porosity | Heat No. 28D512 Per cent Porosity | Heat No. 29D51 Per Cent Porosity |
|---|---|---|---|
| 1 | 1.65 | 2.60 | 2.60 |
| 2 | .94 | .76 | .76 |
| 3 | 2.04 | 1.50 | 1.50 |
| 4 | .82 | .15 | .13 |

The difference in porosity between test castings Nos. 2 and 3 is attributed to the gas content in the added aluminum-titanium master alloy.

It is predicted future specifications for ingots, metals and master alloys for nonferrous melts will contain maximum requirements for gas contents of these raw materials. This has been made possible with the advent of practical gas analyses equipment for metals and alloys. Producers of these raw materials whose manufacturing procedures result in low-gas-content products will have a definite advantage over competitors supplying high-gas-content products. The foundry industry in general will be able to produce sounder castings and products with low-gas-content raw materials more consistently and efficiently than at present.

**Acknowledgments**—For their help in preparation of this article acknowledgments are due the personnel of the Naval Gun Factory Foundry and Laboratory, especially Lewis H. Fawcett, metallurgist, for his direction and technical advice, and Paul O. Ady, Chief Quarterman Molder, for his preparation of production melts for tests and practical foundry guidance.

**TABLE VI—Tensile Properties from Keel Type Separately Cast Test Bars of Nickel-Base Alloys as Cast.**

| | | No Treatment | | | | Vacuum Treated | | | |
|---|---|---|---|---|---|---|---|---|---|
| Heat No. | Alloy | Tensile Strength psi | Yield Strength psi | Elong. in 2 in., % | Brinell Hardness (3000 Kg) | Tensile Strength psi | Yield Strength psi | Elong. in 2 in., % | Brinell Hardness (3000 Kg) |
| 14B62 | MIL-N-20164 | 55,000 | 25,000[1] | 29.0 | — | 77,000 | 32,000[1] | 49.0 | — |
| | | 52,000 | 24,000[1] | 29.0 | — | 77,000 | 32,500[1] | 47.0 | — |
| 15B67 | MIL-N-20164 | 59,000 | 25,500[1] | 41.0 | — | 64,000 | 25,000[1] | 37.0 | — |
| | | 58,000 | 25,000[1] | 44.0 | — | 65,000 | 26,500[1] | 39.0 | — |
| 16D61 | MIL-N-20164 | 76,000 | 30,000[1] | 48.0 | — | 82,000 | 33,000[1] | 50.0 | — |
| | | 76,500 | 30,500[1] | 48.0 | — | 78,500 | 31,500[1] | 47.0 | — |
| 17D62 | MIL-N-20164 | 59,000 | 25,000[1] | 37.0 | — | 74,000 | 31,500[1] | 45.0 | — |
| | | 63,000 | 26,000[1] | 40.0 | — | 75,000 | 30,000[1] | 48.0 | — |
| 23B63 | MIL-N-20165 (Class A) | 77,000 | 35,000[2] | 17.0 | 181 | 105,000 | 38,000[2] | 31.0 | 203 |
| | | 78,500 | 32,500[2] | 18.0 | 183 | 108,000 | 40,000[2] | 31.0 | 196 |
| 24B62 | MIL-N-20165 (Class A) | 90,000 | 42,500[2] | 14.0 | 228 | 120,500 | 47,500[2] | 24.0 | 241 |
| | | 93,500 | 42,500[2] | 16.0 | 227 | 115,000 | 47,500[2] | 21.0 | 235 |
| 21B67 | MIL-N-20165 (Class B) | 95,000 | — | 3.0 | 302 | 135,000 | — | 5.5 | 327 |
| | | 99,000 | — | 3.0 | 302 | 133,500 | — | 5.5 | 332 |

[1]Yield strength at 0.005 in. per in. elongation under load. [2] Yield strength at 0.01% offset.

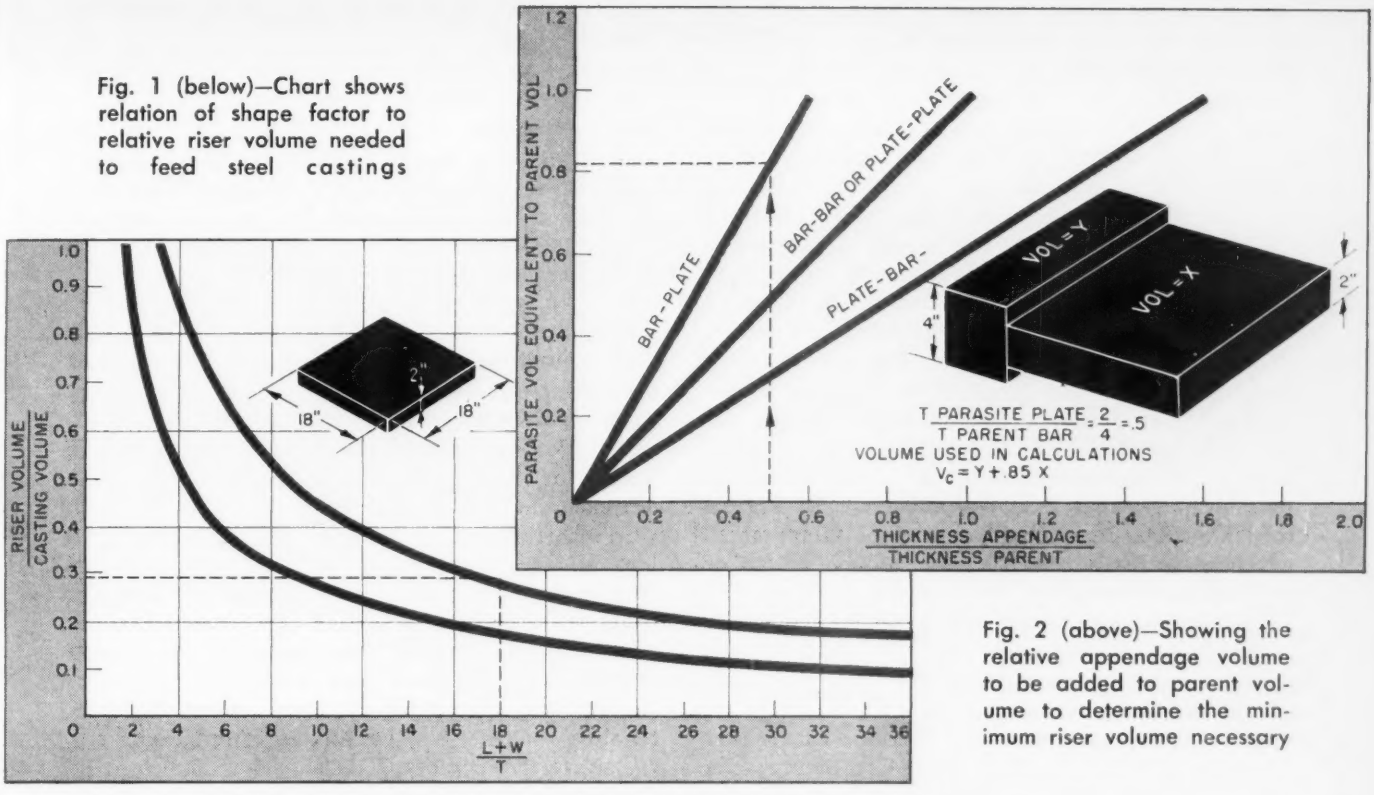


Fig. 1 (below)—Chart shows relation of shape factor to relative riser volume needed to feed steel castings

Fig. 2 (above)—Showing the relative appendage volume to be added to parent volume to determine the minimum riser volume necessary

# Dimensioning of Risers

## *For Nodular Iron Castings*

**Here's a system for determining the smallest risers which can be employed on nodular iron castings without under-riser shrinkage. This article is condensed from a Naval Research Laboratory report**

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RECENTLY the authors developed a method for determining the dimensions of risers required for feeding steel castings.[1] The same procedure with suitable modifications has been applied to determining the smallest risers which can be employed on nodular iron castings without resulting in under-riser shrinkage.

Riser volume needed to feed simple hypoeutectic iron castings was found to be related inversely to the carbon equivalent of the iron and to the surface area to volume ratio of the casting. Complex hypoeutectic iron castings involving appendages can be risered by the proposed system. In such cases an additional step is required to provide for extra riser metal to feed the appendages.

Hypereutectic irons were found to be insensitive to geometry and thickness effects insofar as riser rquirements are concerned. All hypereutectic iron castings require risers with volumes equal to approximately 20 per cent of the casting volume.

**Risering Steel Castings**—The system for calculating riser dimensions of steel castings requires the use of three charts and is based upon the fact, first described by Caine[2], that riser efficiency increases as the ratio of surface area to volume of the casting increases. Thus, for the case of steel, a "chunky" casting such as a cube will require riser volume approximately equal to casting volume, while a "rangy" casting such as a long plate will require a riser volume of only 0.2 of the casting volume. It has been determined that the surface area to volume ratio of the cast sec-

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tion to be fed can be expressed, with a sufficient degree of accuracy, by a shape factor, (L+W)/T, or length plus width divided by section thickness.

The shape factor chart, Fig. 1, indicates relative riser volumes, expressed as a fraction of the casting volumes, needed to feed steel castings having different shape factors. The data obtained from experimental castings made to establish the shape factor and relative riser volume relationships fell within the band shown in this figure. Apparently minor foundry variables affect riser efficiency within the limits represented by the band. Therefore, in using this chart for steel castings, risers which correspond to the top region of the band as shown in Fig. 1, are chosen first so that a margin of safety is provided. Relative riser volumes can be lowered on subsequent castings if the risers on the initial castings are over-adequate. In Fig. 1, the 18 x 18 x 2-in. plate has a shape factor of 18 which indicates a relative riser volume of 0.3 of the casting volume.

Cylindrical sections are considered to have two of their dimensions equal to the diameter of the section. Thus, a 4-in.-diam casting has the same (L+W)/T factor as does a casting of the same length with a 4 x 4-in. cross section. The reason for this is apparent when it is considered that the (L+W)/T factor simply is a means of expressing surface area to volume relationships; calculations will show that these two shapes actually will have the same SA/V ratio. A hollow cylinder is treated as a simple plate or bar section with its width equal to the circumference of the cylinder.

The chart of Fig. 1 is limited in application to sections having simple uniform shapes. Commercial castings, however, usually consist of joined sections of different thicknesses and geometries. In such cases the practice is to place the riser on the most massive section so that the thinner sections can be fed by the large section, which in turn is fed by the riser.

It was shown in the previous study that the volume of riser metal needed for such castings is less than if the volume of the thin sections were present as an extension of the massive section. For example, less riser volume is needed to feed a casting consisting of a 4-in.-thick section with 2-in.-thick sections attached to it than would be required to feed a casting of identical volume which was a uniform 4-in.-thick section. The present method of calculating risers for such complex sections involves determining the fraction of the volume of the thin sections which is equivalent to volume in the massive section insofar as riser requirements are concerned.

In other words, a complex casting is resolved into an equivalent simple section. This is necessary because the (L+W)/T factor for complex castings is determined from the parent section only, and the relative riser volume indicated on the shape factor chart applies only for such sections. Since complex castings are essentially combinations of plate and bar shapes of different sizes, the chart in Fig. 2 was developed to indicate the fraction of the volume of the appendage sections which is equivalent to the volume of the parent section. Different relative appendage volumes may be required for different shape combinations even though their thickness ratios are the same. Curves are shown in Fig. 2 for four different cases: Parent plate with appendage plate, parent plate with appendage bar, parent bar with appendage plate, and parent bar with appendage bar.

The example presented in Fig. 2 shows a 4-in. bar parent section with a 2-in. plate appendage section, and 0.85 of the volume of the appendage is considered as casting volume in the calculations. Thus, in determining a riser for this casting, the (L+W)/T factor would be determined from the

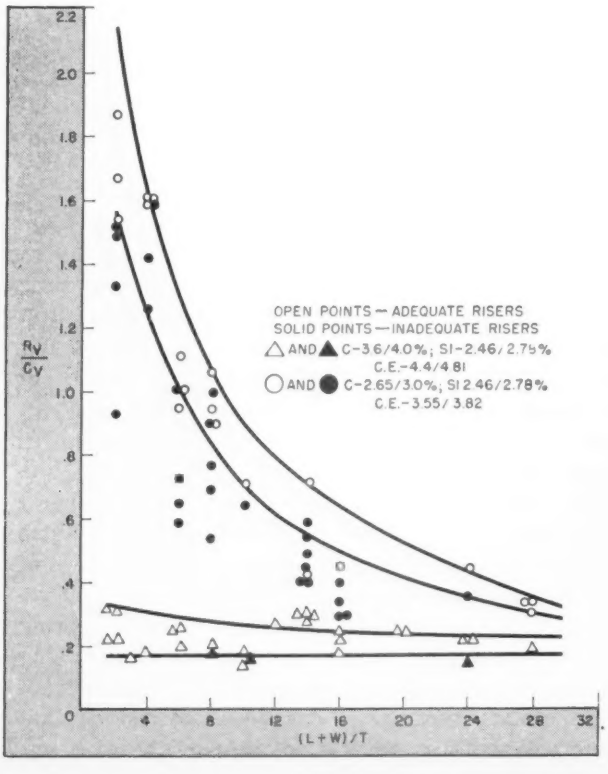
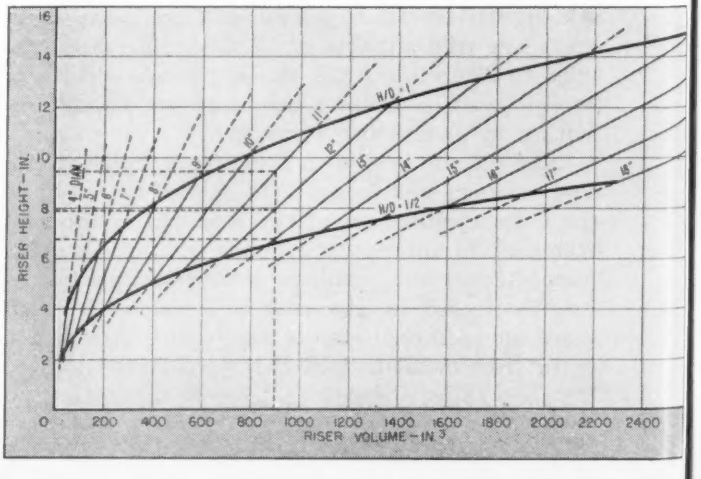
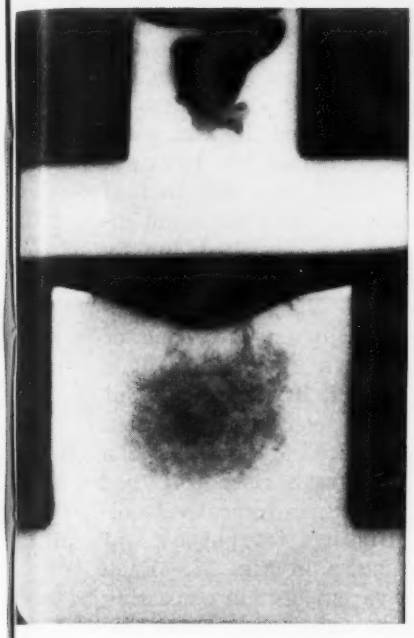
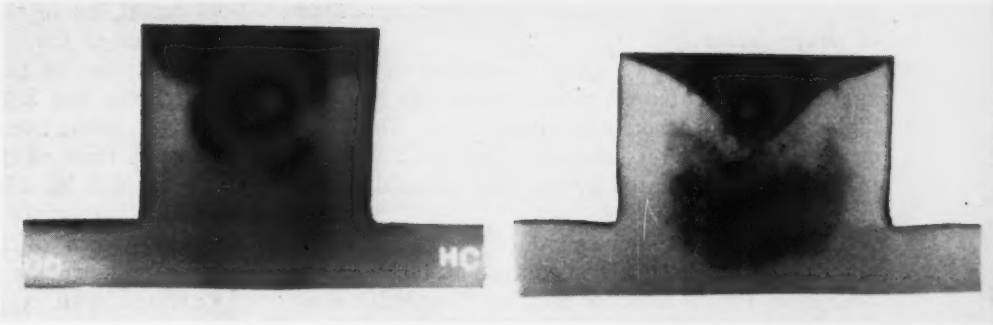



Fig. 3 (left)—Relation of shape factor to the relative riser volume needed to feed irons of high and low-carbon equivalents. Fig. 4 (below)—This chart is for the conversion of required riser volume to the riser dimensions







Transverse radiographs of risers on castings 2 x 8 x 10 in. (Fig. 5, left) and 2 x 14 x 14 in. (Fig. 6, above)

dimensions of the 4-in. bar section. The riser volume to casting volume ratio ($R_v/C_v$) would be multiplied by the sum of the true volume of the 4-in. bar section and 0.85 of the volume of the 2-in. plate section.

Regardless of the shape, thickness, and volume of the appendages attached to the parent shape, the (L+W)/T factor is determined only for the parent shape. In translating the relative riser volume, indicated by the (L+W)/T factor, into true riser volume, the true volume of the part shape plus the percentage of the appendage volume indicated in Fig. 2 is multiplied by the $R_v/C_v$ factor.

Fig. 4 simply interrelates riser height, riser diameter, and riser volume to facilitate translation of the riser volume determined from the preceding charts into actual riser dimensions. The upper and lower curved lines on the chart connect points representing riser heights equal to 1 and to ½ times the riser diameter; it has been found that risers with these height to diameter ratios are the most efficient. Risers having heights greater than their diameter tend to become less efficient because a larger percentage of the riser metal is lost by solidification against the additional riser surface present. For example, if a riser having a volume of 900 cu in. is required, the choice of riser dimensions as indicated in Fig. 4 is limited to risers having a 13-in. diam 7-in. height, a 12-in. diam 8 in. height, or an 11-in. diam 9½ in. height.

**Experiments with Nodular Iron**—In adopting the risering method to nodular iron the chart in Fig. 4 will remain unchanged since it is simply a compilation of arithmetical calculations pertaining to volumes of cylinders. Theoretical considerations suggested that the chart in Fig. 2 could be used without modification because the curves are evolved from basic relationships[1, 2] between the solidification rates of an alloy in a given shape and the thickness of the shape. Thus, even though nodular iron solidifies at slower rates than steel[3], its relative solidification rates with respect to geometry and section thickness should not change. However, modifications representing differences in feeding characteristics of nodular irons as compared with steels must be made to the chart in Fig. 1, which is the basic chart in the method.

To develop shape factor-relative riser volume relationships for nodular iron, cube, plate and bar castings were made having dimensions covering the range of (L+W)/T factors from 2 to 28. Nodular irons having carbon equivalents between 3.55 to 4.81 were investigated. Phosphorus contents in all cases were about 0.03 per cent. The irons were treated in the ladle with 0.2 per cent magnesium added as a ferrosilicon-magnesium alloy and poured at approximately 2600°F. The castings were fed with risers of various diameters and heights covered with a mildly exothermic antipiping compound. Riser adequacy was determined by x-raying a 1-in.-thick vertical section removed from the center of the riser and the casting section immediately below it.

For each shape the riser dimensions were varied to determine a riser such that the riser shrinkage would just touch the riser-casting contact line. This would be the smallest riser which could be used. It has been found, however, that the minimum riser required for a given shape which had been fed with a slightly oversize riser could be established with reasonable accuracy by subtracting from the riser height the distance by which the tip of the riser shrinkage missed the contact line. In a number of cases this approximation was used to expedite the study. Two castings, consisting of parent-appendage combinations, were made to establish the validity of the chart in Fig. 2.

**Results Obtained**—When results of the various tests were plotted—without consideration of chemical composition—on a shape factor-relative riser volume chart, the scatter was so great that it could not be used as a basis for choosing risers. However, when data pertaining to a relatively narrow range of carbon equivalents were plotted, bands similar to those obtained for steel castings were obtained as shown in Fig. 3. For castings with small shape factors, the low-carbon irons will require risers having approximately four times the volume of risers needed on similar high-carbon iron castings; this difference diminishes as the shape factor increases. Riser volumes required for hypereutectic iron castings are independent of shape, a riser volume of approximately 20 per

cent of the casting volume being needed regardless of shape factor.

Figs. 5 and 6 show typical conditions of shrinkage in risers located on identical castings made of high- and low-carbon equivalent irons. The riser on the low-carbon equivalent casting, Fig. 6, is inadequate as indicated by the fact that shrinkage extends into the casting.

Since the riser requirements of nodular iron obviously depend upon carbon equivalent, test data are plotted in Fig. 7 to show relative riser volume as a function of carbon equivalent. Each curve shows the size of risers needed to feed castings having the range of shape factors indicated. Since riser requirements change most rapidly for castings with small shape factors, the range of shape factors encompassed by each curve increases as the shape factor increases.

It may be noted by a comparison of Figs. 1 and 7 that the shape factor-relative riser volume chart developed for steel is applicable to nodular irons having carbon equivalents of approximately 4.00 to 4.15. The scatter of points in Fig. 7, as represented by the bands, is due in part to the influence of minor foundry variables as was the case for the studies on steel, and also to the fact that each curve encompasses a range of shape factors which actually require slightly different relative riser volumes. In using these data, therefore, it is recommended that the first castings made be fed with risers having $R_v/C_v$ ratios near the top of the appropriate shape factor band to provide a margin of safety.

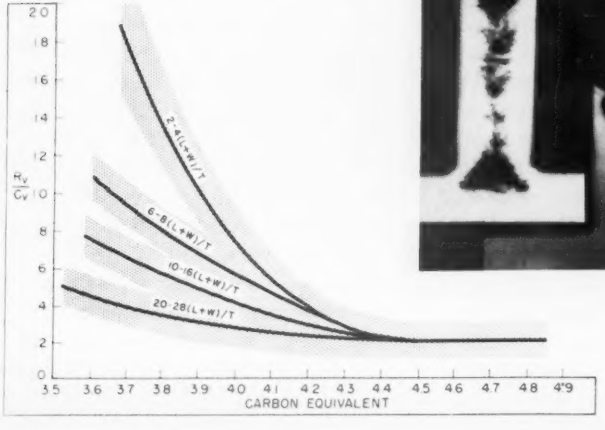
The curves in Figs. 3 and 7 represent only those risers having height to diameter (H/D) ratios of 1 to 0.5. Some castings, however, were fed with risers having H/D values greater than 1 and were unsound despite the fact that the risers contained adequate metal as indicated by shape factor-relative volume relationships. There are two reasons for this: One, as pointed out previously, is that the effectiveness of such risers is reduced by the presence of added surface area on which riser metal is lost by solidification. Secondly, such risers may be so small in diameter that they freeze completely at a time when the casting still requires feed metal, as is the case of Fig. 8 (left). The appearance of the shrinkage in this case indicates that the point of final solidification is within the casting, and the 3½-in.-diam. riser, regardless of its height, could not completely feed the 2-in. plate casting. A riser of the same volume, but having a diameter of 5 in., Fig. 8 (right), was able to feed the 2-in.-thick plate completely. The minimum diameter aspects of risering are provided for by choosing dimensions within the H/D band of Fig. 4.

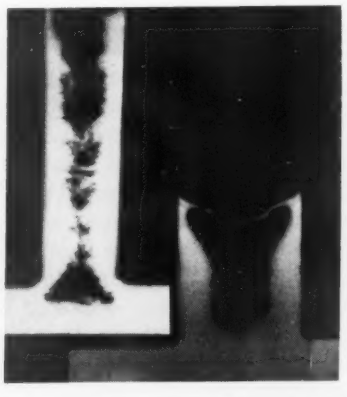
**Castings with Appendages**—Risers were calculated for two castings with appendages, one of them the fitting casting shown in Fig. 10. This casting, made of a low-carbon iron, consisted of heavy flanges attached to a comparatively thin barrel; thus, a riser is required on each of the heavy flange sections. Since each riser will feed half of the casting, the casting is figuratively divided into two separate castings for purposes of making the calculations shown in Fig. 11. Each of the risers must feed a parent section consisting of one flange and an appendage section consisting of half of the barrel.

It may be noted that in calculating equivalent casting volumes the curve of Chart B (Fig. 11) and Fig. 2, representing a parent bar with an appendage plate, was employed. In developing the chart of parent-appendage relationships a true bar shape was considered to be a casting of symmetrical cross section, such as a circle or square, with a length of at least five times the thickness or diameter. A true plate is considered to be a casting of uniform thickness with length and width dimensions of at least 5 T.

Theoretically, additional curves should appear on Fig. 2 for shapes having dimensions not covered by these definitions; however, such exactness is not necessary and the most applicable curve of Fig. 2 is used. Thus, the flange of the fitting, which has a cross section of 2½ x 3½ in. is considered to be a bar since its shape more nearly approaches that of a bar than a plate; the barrel of the fitting is a definite plate shape. The median lengths of the curved flange and barrel sections, needed for the determination of the (L+W)/T factor and the section volumes, were accurately calculated in

Fig. 7 (below) — Interrelationship of carbon equivalent, riser volume and the shape factor



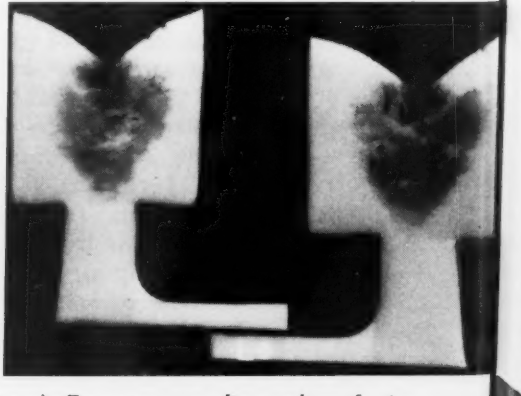


Fig. 8 (left, above)—Transverse radiographs of risers of different sizes on 2-in.-thick plate castings

Fig. 9 (right, above)—Transverse radiographs of the risers on fitting casting, as calculated in Fig. 11

this case as shown in Fig. 11, but in the practical application of this risering system to steel castings[4] it has been found that simplifying approximations may often be made.

Many calculations can be avoided by using a tape measure to obtain the necessary dimensions from the pattern. For example, the tape could be laid along the mid-length of the flange to determine its average length, and the (L+W)/T determinations made from this measurement. The volume of the flange could be determined by multiplying this measured length by the width and thickness of the flange. Similarly, since its wall thickness is relatively thin, the barrel volume could be considered as the product of its circumference, as measured with a tape, and its length and thickness.

Fig. 9 shows radiographs of segments through the riser and part of the fitting casting which was fed with the risers calculated in Fig. 11. A sound casting was obtained and the risers were of the minimum size.

On the basis of the results obtained, it is concluded that the equivalent volume chart of Fig. 2 is applicable to nodular iron as well as steel castings.

**Minimum Riser Diameter**—To feed steel castings it was found that the riser diameter should be great enough to cause the riser to remain liquid until after the casting solidified. The minimum riser diameters required for steel cubes, bars and plates were found to be 1.1T, 1.6T, and 2.5T where T equals the casting thickness. Such risers have freezing times slightly in excess of the freezing times of the castings which they feed. Risers below these minimum diameters could not completely feed their castings regardless of how much their volume was increased by increasing riser heights. For the case of the higher carbon nodular irons, however, riser diameter-casting thickness relationships of this magnitude are not required—in other words, a riser which freezes before the casting may suffice to feed the casting. An example of such case is shown for the high-carbon iron in Fig. 5. On the other hand, the riser diameter must not fall below a certain minimum if under-riser shrinkage of the type shown in Fig. 8 is to be avoided.

Each iron composition undoubtedly requires a different minimum riser diameter (freezing time) in order to supply sufficient feed metal to a given shape. Such information was not determined experimentally, but it appears that if the riser dimensions needed to supply the calculated volume are chosen so that their height-to-diameter ratios are between 0.5 and 1.0, the diameter requirement will be automatically fulfilled.

The reason that riser diameters smaller than those required for steel may be used on nodular iron castings arises from the fact that some self-feeding occurs in iron as a result of volumetric expansion during nodule formation. This expansion tends to force interdendritic liquid into incipient shrinkage voids in a manner similar to that which occurs at the eutectic in gray iron. In addition, some of the reduction in riser requirements must be ascribed to the different solidification modes of high and low carbon irons.


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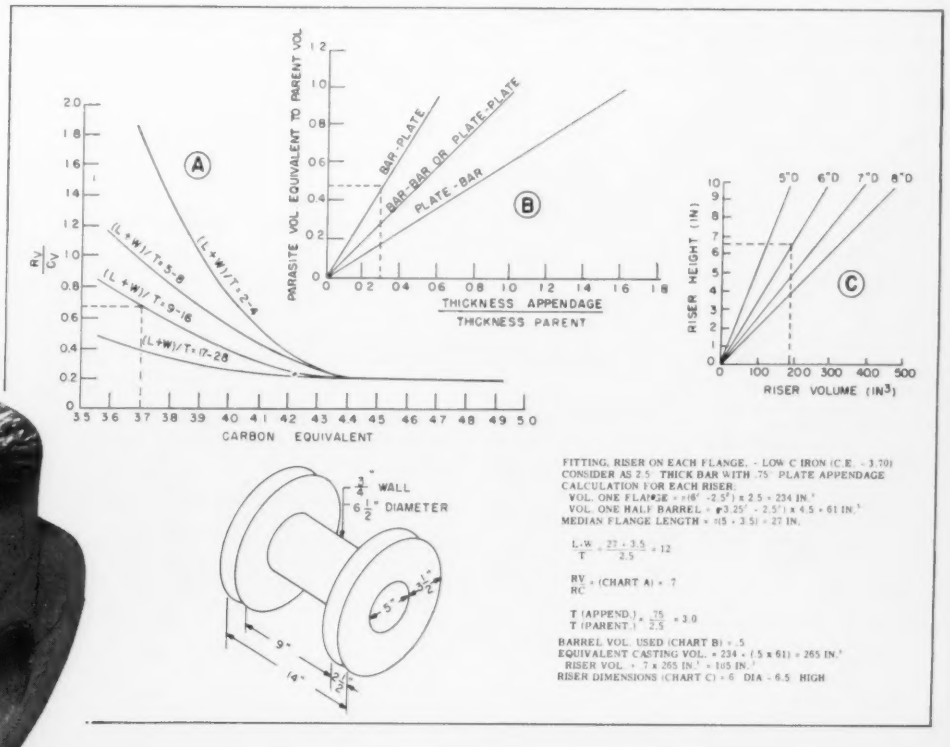
Fig. 10 (below) — Fitting casting was risered according to calculations which are shown in Fig. 11 (right)

Fig. 11 (right) — Calculations for risers on fitting casting in Fig. 10, where carbon equivalent is 3.7


A
B
C
(L+W)/T=5-8
(L+W)/T=9-16
(L+W)/T=17-28
(L+W)/T=2-4
RV/CV
CARBON EQUIVALENT
PARASITE VOL EQUIVALENT TO PARENT VOL
BAR-PLATE
BAR-BAR OR PLATE-PLATE
PLATE-BAR
THICKNESS APPENDAGE / THICKNESS PARENT
RISER HEIGHT (IN)
RISER VOLUME (IN³)
5"D
6"D
7"D
8"D
¾" WALL
6½" DIAMETER
3½"
5"
9"
14"
FITTING, RISER ON EACH FLANGE. - LOW C IRON (C.E. = 3.70)
CONSIDER AS 2.5" THICK BAR WITH .75" PLATE APPENDAGE
CALCULATION FOR EACH RISER:
VOL. ONE FLANGE = π(6" -2.5²) x 2.5 = 234 IN.³
VOL. ONE HALF BARREL = π3.25" - 2.5²) x 4.5 = 61 IN.³
MEDIAN FLANGE LENGTH = π(5 + 3.5) = 27 IN.
(L+W)/T = 27 + 3.5 / 2.5 = 12
RV/RC = (CHART A) = 7
T (APPEND.)/T (PARENT.) = .75/2.5 = 3.0
BARREL VOL. USED (CHART B) = .5
EQUIVALENT CASTING VOL. = 234 + (.5 x 61) = 265 IN.³
RISER VOL. = 7 x 265 IN.³ = 105 IN.³
RISER DIMENSIONS (CHART C) = 6" DIA - 6.5" HIGH

# Questions and Answers

**Defect in centrifugally cast heavy tube possibly may be caused by vibration, but other factors may be responsible . . . Describes some features of soil pipe core production . . . Suggests changes in gate to eliminate trouble . . . Smooth surface requires finer sand**

## Centrifugal Casting Trouble

QUESTION We have been producing brass castings by the centrifugal process for some time, but occasionally run into problems which are hard to solve. One example is that shown by the accompanying piece of a tube which exhibits what we term lap marks. This defect appears in about 80 per cent of our heavy work or that weighing over 200 lb. This particular casting is spun on practically a horizontal axis in a carbon mold. Mold is 16 in. long with one end 10 in. above the horizontal plane and the other end 12 in. Rough dimensions of casting are 12 in. OD, 9 in. ID, and 16 in. long. Weight is about 250 lb. Metal at 2000°F is poured through a spout similar to a funnel, with the small end opening 1¼ in. in diam. Mold spins at about 750 rpm.

ANSWER One thing we would look into as the possible cause of the defective castings is vibration. It may be that with the heavy mold and metal that the machine at 750 rpm operates in a critical range. Usual procedure is to try a reduced speed of rotation, but sometimes a slight increase may accomplish the same result. At present it appears you are operating with a centrifugal force equal to 84 times gravity, and castings are made successfully with a range of 45 to 100 times gravity. In the case of this particular casting the speed range could be from about 530 rpm for the lower centrifugal force to about 820 rpm for the higher force.

Possibly the trouble may be due to a cold mold or too low a pouring temperature or a combination of the two. Again the cause may be lack of proper distribution of molten metal against the rotating mold wall. Two suggested remedies for that are use of trough pouring and step pouring. In the former a semicircular trough with a 6-in. radius and 15 in. long will hold 254 lb of metal, which is sufficient to pour the tube. It is filled with molten metal and turned over in the same direction as the mold rotation, distributing the metal as a long sheet or ribbon against the mold wall.

In step pouring about one-fourth to one-third of the weight of metal to be used is poured with the mold at rest or rotating very slowly, and then without any cessation in pouring, the mold is brought up to speed as quickly as possible. That procedure approaches the function of trough pouring by providing a layer of metal along the length of the mold surface.

Arrows in illustration show defects appearing in centrifugally cast tube

## How To Make Soil Pipe Cores

QUESTION We are planning production of 2 to 4-in. diam soil pipe in our foundry in Central America, and urgently need some detailed information on the method of making cores for single and double bell end pipe. In the practice we want to follow, the cores are made in a lathe type machine by rotating a vented metal arbor on which the sand is delivered from an elevated hopper, and the sand is swept against the arbor by a forming plate or core knife located below. We would like to have information on the following: a) The machine itself, the design, characteristics, dimensions, etc. b) Method of placing the core knife to regulate the sand thickness on the arbor. c) Shape of the sand hopper and devices required to feed the sand properly onto the arbor. d) Relative positions of core knife and arbor to obtain most efficient sweeping of the sand. e) Method of fastening the arbor to the machine. f) Type of sand suitable for making cores by this method.

ANSWER Since we do not have the detailed information you request, we will endeavor to provide the general aspects of the procedure which may enable you to develop suitable equipment and practice.

As you indicate, perforated arbors are employed. They may be made of cast iron or seamless steel tubing and are about ⅞-in. smaller in diameter than the inside of the pipe to be made, to provide a sand thickness of ⅜ to ½-in. For single bell-end pipe, a collar to give the same sand thickness as on the rest of the arbor, is permanently attached to one end of the arbor. In the case of double bell-end pipe, a loose collar affixed with a wood wedge is placed on the opposite end of the arbor.

In producing the cores, the arbor, previously wetted with water or thin clay wash, is placed on a suitable stand beneath an elevated sand hopper with a V-shaped bottom. The arbor supporting stand is equipped with bearings at each end so that the arbor may be rotated easily. Bearings are such that the centerline or axis of the arbor is level and parallel to the leading edge of the strickle or blade which controls the sand thickness applied. The bottom of the sand hopper may be 18 to 24 in. above the arbor, and the height to some degree depends upon the sand being used. You may have to experiment to determine the most suitable height since the greater the drop, the harder the packing. Bottom opening of the hopper is a narrow slot extending the full distance between the bearings, and permits the sand to fall in a thin stream onto the centerline of the rotating arbor. The arbor may be rotated by hand using a taper plug and crank, or mechanically by employing a simple clutch. Rotation speed is about 150 sfm.

The strickle or blade used to control the sand thickness is contoured on one or both ends to form the bell or bells, and located so that the leading or cutting edge is along the centerline of the arbor. The back edge of the strickle is dropped about 45 degrees so that the sand scraped off slides to the floor rather than piles up on the leading edge of the blade. The strickle is arranged so

that it is adjustable within close limits. It hardly should be necessary to point out that the completed core controls the inside diameter of the pipe which cannot be over the specified dimension or more than ⅛-in. under it.

Sand used for the cores is the same as that employed for the molds, and the cores are used in the green state.

## Gating May Be Responsible

QUESTION We are sending for your consideration one complete malleable iron insulator cap and fractured sections of the top of another, both from the same ladle of iron. On the broken section are some dark areas, and we would like to know the cause and cure. Pattern consists of a plate of four pieces with feeders attached. Iron composition is 1.00 to 1.10 per cent Si, 2.40 per cent TC, 0.06 per cent S, 0.13 per cent P, and 0.35 to 0.39 per cent Mn.

ANSWER Examination of the fractured pieces of the insulator cap under a magnifying glass indicates that the small dark patches are shrinks since they exhibit the typical feathery, dendritic structure. Out of curiosity we fractured the other or whole casting, and found similar dark areas in the same locations but not as many. Also those areas, while coming practically to the surface, do not show the tiny openings which are visible on other or fractured pieces—and which undoubtedly led you to suspect possibility of a defect.

The dark areas in question are located at the top and bottom of the gate into the casting and against the core. While it is easy to locate the defect, it is another matter to account for its occurrence, and to suggest remedial procedure. We doubt that it is a "hot spot" defect since it does not occur immediately back of the gate where the metal impinges on the core, but some distance away.

We suspect that it is due to the manner in which the metal flows into the cavity. The metal strikes the core head on with considerable force, and the stream, in changing its direction of flow to pass upward and downward into the cavity, leaves small air pockets in the areas where the defect occurs, and which do not receive any metal until the whole cavity is filled. By that time the adjacent sections are in the last stages of solidification and prevent proper feeding.

If that surmise is correct, the obvious remedy would be to reduce the force of the metal stream against the core. While you mention that there are four patterns with feeders on the plate, we do not know the specific arrangement. If the runner from the sprue into the feeder is directly opposite the gate from the feeder to the cavity, we suggest changing the location of the runner so that there is not a straight flow to the casting cavity. If possible, it is preferable to have the runner enter the feeder at a tangent.

Dark areas indicated may be caused by characteristics of flow of metal

Another possibility is to change the gating so that the metal is brought into the casting at the small end parallel to the contour of the casting by arranging the patterns radially around a central sprue.

## Suggests Use of Finer Sand

QUESTION We manufacture for our own line of electric ranges some cast iron door handles and other hardware as shown in the accompanying sketches. Since all castings are chrome plated a great deal of abrasive polishing is involved. Competent polishers are scarce and hard to train with the result that polishing is the bottleneck of our range production. The reasons we continue to make the parts of cast iron are that the quantities for any one item do not exceed 5000 per year, and it supplies work to our foundry whose daily output has been cut in half in the past decade. We have read and heard that shell molding gives improved casting surfaces, and some have suggested we adopt the lost wax process. We are interested in selecting a method involving the least capital expenditure to achieve the desired results.

ANSWER In view of the relatively low production requirements and your remarks on obtaining results with the least capital expenditure, our suggestion is to make a careful study of your present practices to determine the probable causes for the unsatisfactory castings, and then take steps to eliminate them one by one. As you probably know, adoption of entirely new procedures involves considerably more than just buying a new machine or two and some new materials. The know-how on details of operation have to be acquired.

Your remark about the polishing department being the bottleneck in production indicates that surface appearance is the prime trouble. Since in general the surface smoothness is dependent upon the sand used, we suggest you look into that situation first. One step in that direction would be to consult with your sand supplier and obtain for experimental purposes small batches of fine grain sands—120 AFS fineness and finer—and use them as thin layers of facing sand against the patterns. The facing sands could be compounded with additions of seacoal and/or wood flour and other additives to observe the effects. We are sure that experimental work along that line will enable you to produce castings which will require the minimum polishing preparatory to plating.

## Adding Phosphorus to Copper

QUESTION We are interested in producing phosphor-copper (15 per cent P) for use in our bronze foundry in Chile. We have an indirect-arc furnace and later will have a similar rocking type unit. We have tried making the alloy with little success, and will appreciate information on fluxes, time of melting, molds, etc.

ANSWER Production of phosphor-copper is hazardous from the health viewpoint in that extremely poisonous phosphorus vapor is emitted during the operation. Hence, the

work must be conducted in a well-ventilated area, and preferably where the fumes are carried away by a mechanical exhaust system. In making the phosphor-copper we suggest use of the red, amorphous type since it does not have to be kept under water as in the case of the more common, yellow variety.

We gather from your reference to the indirect-arc furnace that it is the only available melting unit. In that case the red phosphorus is placed in a holder commonly termed a "phosphorizer" and plunged beneath the surface of the metal until the reaction ceases. The phosphorizer essentially is a cup perforated with a number of small holes to permit escape of vapors or molten material developed by the reagent within the cup when in contact with the molten metal. Preferably the phosphorizer is made of graphite by closing one end of a tube, and arranging the closed end for attachment of a long handle. Upper portion near the closed end is drilled full of small holes.

In use the phosphorizer is charged nearly full of the material to be used, in this case red phosphorus, and then the open end of the tube is closed by wadding in copper turnings or even paper sufficiently tight to keep the reagent from falling out during handling. The charged phosphorizer is plunged beneath the surface of the molten metal as deeply as possible so that the phosphorus vapor has to travel through a deep layer of metal. Phosphorizer is moved back and forth beneath the surface to get better distribution.

Since red phosphorus is relatively light, weighing about 0.07 lb per cu in., a number of phosphorizers will have to be available to introduce sufficient material on any sizable scale. While the melting point of red phosphorus is about 1360°F, it will ignite at around 400°F. Although we do not have any definite information on losses of phosphorus in such an operation, we recall references to as high as 50 per cent.

If you have a crucible furnace you could place thin alternate layers of red phosphorus, charcoal, and copper turnings, borings or shot in the crucible, and seal on a cover as tightly as possible. Place the crucible in the furnace and heat it gradually to the melting point of the alloy. Molten material may be poured into iron molds to form thin flat cakes. Solid phosphor copper is a brittle alloy and easily broken into small pieces.

Possibly with the electric furnace you might be able to accomplish direct reduction of phosphorus from a material such as superphosphate rock. Since it appears that this material contains about 23 per cent P, you might try a combination of intimately mixed phosphate, sand and charcoal as the phosphorizing flux. For approximately a 100-lb batch, we suggest 85 lb copper as shot, turnings or borings with 150 lb of the flux, which is composed of 90 lb superphosphate, 25 lb silica sand and 35 lb crushed charcoal. Ingredients of charge are placed in alternate layers with the flux as the first. Top of the last charge or layer is covered heavily with charcoal.

## Defect Caused by Loose Sand

**QUESTION** We make a large volume of brass plumbing fittings. Many of them are pitted and show a wormy surface on the drag side only, as shown by the two specimens sent for examination. Molds are dumped alongside the molder and the hot sand is reused. Molder has cold sand by his machine which is used to face the cope and drag. However, the pattern remains in the drag longer than in the cope, and we find we have sweat in the drag. Molding sand used is No. 00 Albany and we have no muller. Cores are made of sand with an AFS fineness of 76 with a resin binder and baked in a dielectric oven. We get a peel off the cores and when the molder sets the cores a certain amount of core sand drops into the mold and is not blown out. There is some disagreement as to the cause of the poor surface on the drag side which we believe is due to use of hot sand. Can you offer any suggestions?

**ANSWER** The specimen castings sent for examination, unfortunately, were carefully cleaned, and as a result diagnosis as to the possible causes of the poor surface on the drag side was made difficult. However, study of the appearance of the pits and later examination under the magnifying glass led to the conclusion that they are caused mainly by sand particles. The fact that sand dropping from the cores is not blown out after setting the cores would lead to such a surmise in itself. That does not eliminate the possibility of the hot sand having some slight effect, especially if tight bottom boards, rubbed on are used. If the hot sand had a major effect, we believe defects would appear on cope and drag.

Drag surface of brass fitting shows numerous holes or pits due to sand

It looks to us that the core department could stand a little study to determine why good cores without friable surfaces cannot be produced. Again it seems rather sloppy practice not to blow out the molds when the likelihood of sand particles being present is known.

## Production of Plaster Molds

**QUESTION** We will appreciate receiving some information on procedures to be followed in plaster molding.

**ANSWER** Production of castings by plaster molding is not difficult after gaining experience. Metal casting plaster may be purchased already compounded for use, and manufacturer's directions should be followed closely. Generally about 1.7 lb water is used with 1 lb plaster, and the plaster is scattered into the water. Mixture is stirred until it is of creamy consistency and then poured into the flask around the pattern.

The mix should be poured slowly from one edge to eliminate air bubbles forming on the pattern face. Vibration of pattern and flask during pouring, or use of a stiff bristle brush will help in breaking bubble formation. Patterns or models must be smooth, and brass patterns seem to give best results. Wood patterns can be used, but must be sanded as smoothly as possible, given two coats of synthetic resin varnish, and polished. Before being covered with the plaster, patterns are given a thin coating of parting material which may be lard oil, paraffin oil, soap solution, etc. One mixture is composed of 75 per cent kerosene, 25 per cent light oil to which 1 per cent of a wetting agent is added.

Since plaster is an insulating agent, gates and risers may be smaller than in the case of sand castings. Those may be mounted on the pattern or easily cut into the moist, but air-set plaster. After pouring the plaster over the pattern, it is allowed to stand for 20 to 25 minutes to harden. Although still moist, the plaster has sufficient strength to be removed from the pattern with a little care in the operation. Mold is dried by placing in an oven at 400 to 600° F for 8 to 16 hr depending upon its thickness. Higher temperatures permit decrease in drying time. Molds are allowed to cool in the oven at 150 to 300° F, and filled with metal while they still are warm.

ROYER *presents . . .* **Magna-San**

Long sand stream, adjustable from 5′ to 20′.
15 cu. ft. receiving hopper.
Permanent Alnico 12″ dia. magnetic pulley.
180° swivel for sharp turning.
Large automotive type wheels and bearings.
Rugged welded box frame suitable for stationary mounting.
Heavy duty, cleated, endless conveyor belt.
Ample trash box for metal, core butts, wedges, gaggers, etc.

# a new SAND CONDITIONING unit with magnetic separation

Magna-San is another *new* addition to the Royer Line of Sand Conditioning Equipment. This compact and highly portable machine is designed for any foundry, large or small, where sand heaps are conditioned right on the shake-out floor. Designed for front end loader feeding, this unit can heap or windrow magnetically cleaned and Royer mixed, blended and aerated sand as fast as a loader can be positioned for discharge. The "Magna-San way" is faster and easier than hand shovelling and at a lower equipment investment than any other mechanical method yet devised for conditioning foundry sand.

Magna-San is available in two models, the portable RMP as pictured above and the stationary RMS. Write for further details on our new low-cost method of cleaning and conditioning your sand.

*features:*

1. Magnetically cleaned sand at 45 tons/hr.
2. Royer mixing, blending, and aeration
3. Hopper feeding from 3 sides
4. Long discharge stream for piling or windrowing
5. Compact—only 90″ long x 60″ wide
6. Easily portable—6½′ radius of turn, large wheels and bearings
7. Rugged construction

*Foremost in Sand* ROYER *Conditioning Equipment*

**ROYER FOUNDRY & MACHINE CO.** 159 PRINGLE ST. KINGSTON, PA.

# Men of Industry

● HILLARD M. PATTON
*. . . foundry division mgr.*

● JOHN STOBBS
*. . . adm. foundry mgr.*

● JOHN G. SCHAEFFER
*. . . becomes mfg. manager*

● HYMAN ROSENTHAL
*. . . joins Arwood Precision*

**HILLARD M. PATTON,** formerly foundry superintendent, was made manager of the Foundry Division, American Hoist & Derrick Co., St. Paul. A graduate of Ohio State University, he was foundry superintendent, Superior Steel & Malleable Casting Co., Benton Harbor, Mich., prior to joining American Hoist 15 years ago. **Harry A. Anderson,** for 3 years machine shop superintendent, was made manager of general manufacturing in the St. Paul plant. **Walter R. Olson,** manufacturing co-ordinator, was made production control manager of the St. Paul and Ft. Wayne plants. **Ernest S. Egertson,** for 8 years assistant industrial engineer, has been appointed chief industrial engineer at the St. Paul plant.

**Eugene A. Lange,** for the past 3 years research engineer, Gray Iron Research Institute Inc., Columbus, O., was named head of the castings section, Metallurgy Division, Naval Research Laboratory, Washington, succeeding **Harold F. Bishop,** who recently joined Exomet Inc., Conneaut, O. Mr. Lange was connected with the AFS Malleable Iron Project at University of Wisconsin for 2 years after receiving his master's degree there in 1951.

**Howard H. Wilder,** formerly assistant manager, was appointed manager of engineering sales, Vanadium Corp. of America, New York, with headquarters in Chicago. He was previously in Detroit, as manager of the Iron Foundry Division.

● **John Stobbs** was named administrative manager of the foundry, Light Metals Division, Thompson Products Inc., Cleveland. A graduate of Purdue University, he joined the company's process control department 5 years ago as a metallurgical engineer.

● **John G. Schaeffer,** formerly foundry superintendent at the Vernon, Calif., plant, General Metals Corp., San Francisco, was named manager of manufacturing of the Oakland foundry. Prior to joining General Metals, for 5 years Mr. Schaeffer was general superintendent, Lycoming Division, Avco Corp., Williamsport, Pa., and for 10 years was associated with Packard Motor Co., Detroit.

**Dr. James K. Sprinkle** was appointed applied research engineer in the Applied Research and Development Laboratory of General Electric Co.'s foundry department, Schenectady, N. Y., where he will work in the field of foundry molding and mold materials. In 1950 he was graduated from Virginia Polytechnic Institute, where he recently was acting head of the metallurgical engineering department. He has a master's degree and doctorate from Massachusetts Institute of Technology.

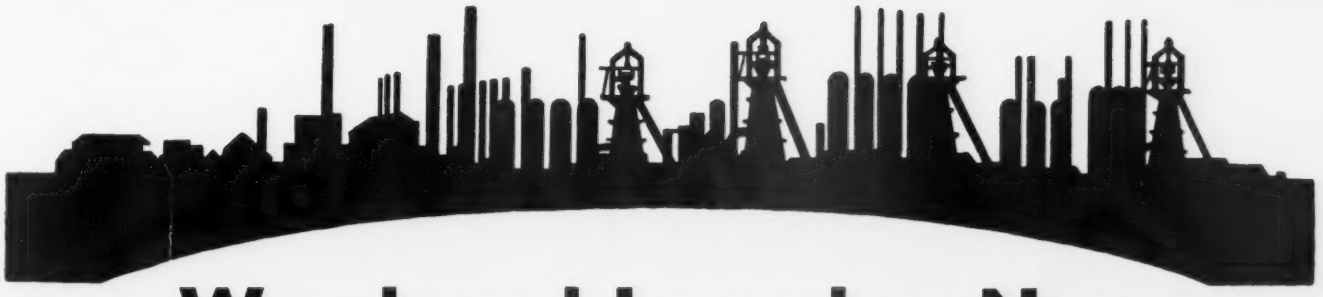
**Carl E. Rowe,** formerly assistant general manager, Milwaukee Valve Co., subsidiary of A. P. Controls Corp., Milwaukee, was named vice president-general manager and a director.

● **Hyman Rosenthal** has joined Arwood Precision Casting Corp., New York, as director of research. Since graduation from Yale University in 1939, he was associated with the Metallurgy Research Laboratory of the Frankford Arsenal, Philadelphia, where he headed the foundry research division for 11 years. In 1954 he was appointed deputy director of the laboratory.

**Charles E. Coulter,** recently assistant sales manager, Foundry Products Division, Archer-Daniels-Midland Co., Cleveland, has been appointed western sales manager with headquarters in Cleveland. He has been with ADM since 1946. **Daniels R. Chester,** with the company in various technical capacities since 1945, has been named manager of technical service. **Anton Dorfmueller Jr.,** for the past year sales representative in the Buffalo area, has been made eastern sales manager. His headquarters also are in Cleveland.

**Theodore E. Padkins,** formerly assistant works manager, Scullin Steel Co., St. Louis, was named works manager, succeeding the late Joseph D. Walsh.

**J. F. Costigan,** since 1953 works manager of the Norwood, O., Works, Allis-Chalmers Mfg. Co., Milwaukee, was appointed assistant director of manufacturing of the company's Industries Group, succeeding **Arnold I. Thorsen** who was made general manager of the Terre Haute, Ind., Works. **Enoch While,** since 1947 chief inspector at the Norwood Works, has



# Woodward Launches New National Advertising Program to Help Sell Foundry Products

During the past two years, Woodward Iron Company has conducted at its own expense a national advertising campaign to promote the use of cast iron products by its customers.

This campaign has been so signally successful that Woodward's management has authorized a broader sales promotion effort in behalf of cast iron products for the 12 months beginning October 1, 1956.

Woodward's advertisements, featuring the many advantages of cast iron products, will appear in both consumer magazines and trade periodicals with a composite circulation of 5,282,101.

Woodward hopes this campaign will further stimulate the sales of your foundry's products, and invites your inquiries for uniform, quality merchant iron—foundry or malleable grades.

**For quotations, write or call our**
**Sales Department, Woodward, Ala.**
**Phone Bessemer, Ala. 5-2491**
**or Sales Agents for territory north of Ohio River:**
**HICKMAN, WILLIAMS & COMPANY with Sales Branches at—**

609 Bona Allen Building, Atlanta 3, Ga.; 230 North Michigan Avenue, Chicago 1, Ill.; First National Building, P. O. Box 538, Cincinnati 1, Ohio; 1659 Union Commerce Building, Cleveland 14, Ohio; 1203 Ford Building, Detroit 26, Mich.; P. O. Box 335, Duluth 1, Minn.; 412 Guaranty Building, Indianapolis 4, Ind.; 70 Pine Street, New York 5, N. Y.; 1500 Walnut Street Building, Philadelphia 2, Pa.; 1910 Clark Building, Pittsburgh 22, Pa.; 902 Syndicate Trust Bldg., St. Louis 1, Mo.

# Woodward Iron Company

**WOODWARD, ALABAMA**

*Independent Since 1882*

## MEN OF INDUSTRY

● G. A. GILBERTSON
*. . . pres., Frank G. Hough Co.*

● PHILIP O. GEIER JR.
*. . . becomes assistant mgr.*

● HAROLD W. COTTRELL
*. . . new sales mgr.*

● BRUCE B. BURKET
*. . . joins Albion Malleable*

succeeded Mr. Costigan as works manager there. **R. C. Lathrop** was named chief inspector and **C. E. Wikoff** becomes Mr. Lathrop's successor as assistant chief inspector at Norwood.

● **G. A. Gilbertson** was elected president, Frank G. Hough Co., Libertyville, Ill., subsidiary of International Harvester Co. Frank G. Hough, founder and former president, was made chairman of the board. Vice president-general manager since last year, Mr. Gilbertson previously was vice president in charge of sales, advertising and service.

● **George T. Dupre** was appointed assistant to the president, National Engineering Co., Chicago. He will continue to have charge of advertising and sales promotion activities. A graduate of University of Illinois, he represented National Engineering Co. for C. P. Guion Associates until 1950, when he joined National as process engineer.

● **Philip O. Geier Jr.** was appointed assistant manager, and **Harold W. Cottrell,** sales manager, Cincinnati Milling Products Division, Cincinnati Milling & Grinding Machines Co., Cincinnati. Mr. Geier, with the company over 17 years, was sales manager for the last 2 years. Mr. Cottrell joined the firm in 1936.

● **Alfred C. Quist** was named vice president, E. J. Machine & Pattern Corp., West Springfield, Mass., affiliate of Production Pattern & Foundry Co., Chicopee, Mass. Previous connections in the foundry and pattern industry include Universal Pattern & Model Shop, Hartford, Conn., Electric Boat Co., Division of General Dynamics, New London, Conn., and Reynolds Metals Co., Louisville.

● **Michael J. Ego** recently joined Atlantic Steel Castings Co., Chester, Pa., in a supervisory capacity. In 1923 he became an apprentice at Midvale Co., Philadelphia, and was foundry superintendent there when the company discontinued its foundry this year.

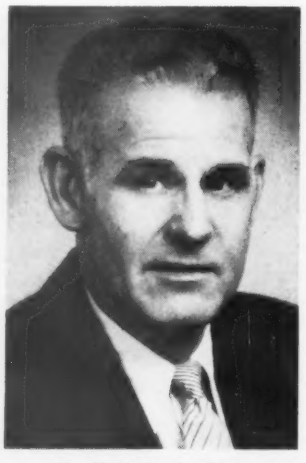
● **Bruce B. Burket** has joined the sales staff of Albion Malleable Iron Co., Albion, Mich. A graduate of Ohio State University, Mr. Burket was previously associated with General Motors Corp., in Defiance, O., and Saginaw, Mich.

**Le Roi E. Snyder** was elected president, Carver Foundry Inc., Fairview Village, Pa. **Frank J. Arnold** was named vice president, **Mildred A. Kriebel,** secretary-treasurer, and **William J. White,** plant manager.

**E. Forrest Kulp** was appointed Cleveland district sales manager, American MonoRail Co., at its home office there. **V. Wellborn Cook** replaces Mr. Kulp as district manager in Charlotte, N. C.

● **Harold C. Templeton,** formerly chief metallurgist, Lebanon Steel Foundry, Lebanon, Pa., recently

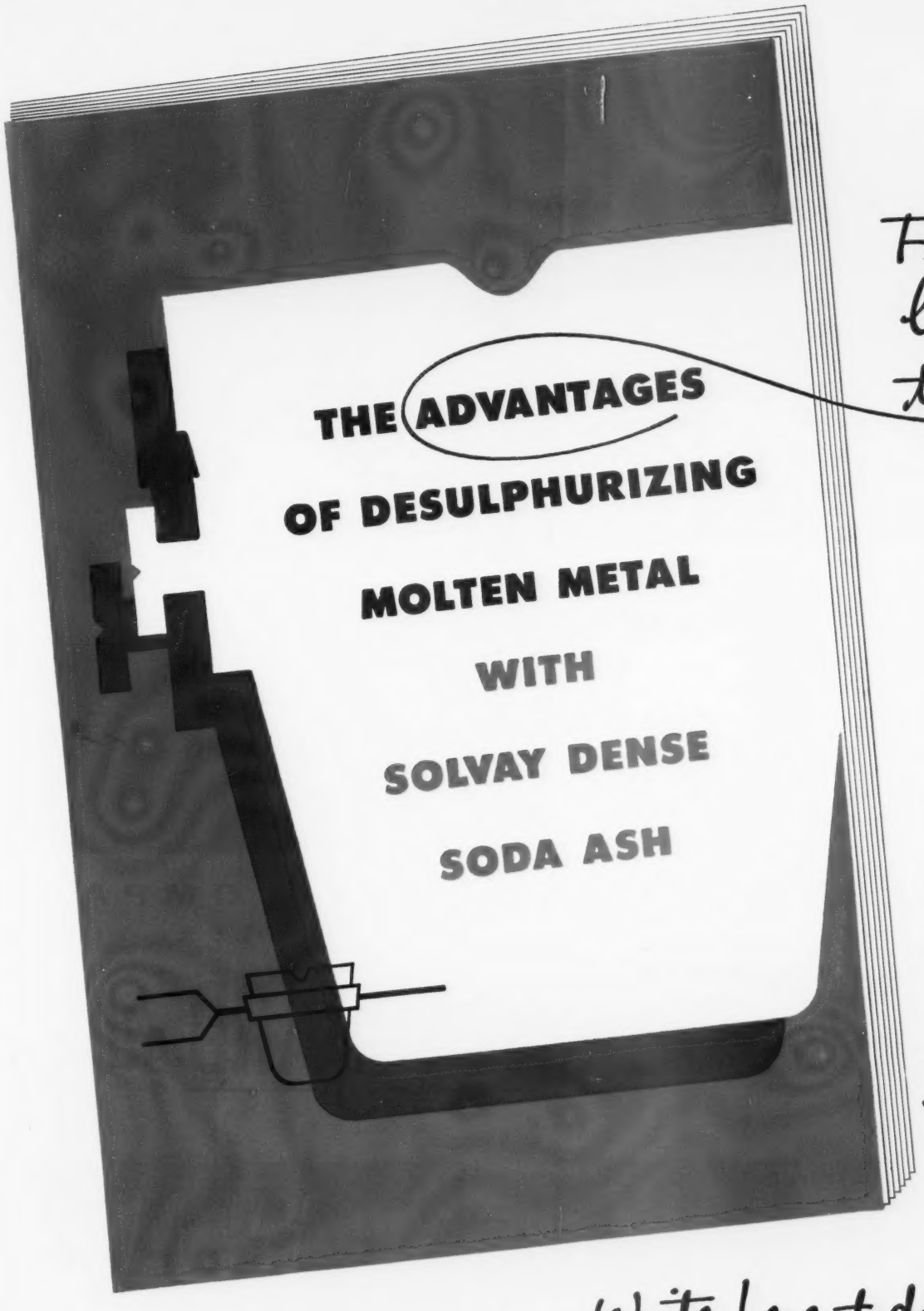
● GEORGE T. DUPRE
*. . . president's assistant*



● MICHAEL J. EGO
*. . . joins Atlantic Steel Co.*

● ALFRED C. QUIST
*. . . Machine & Pattern Co. v. p.*

● HAROLD C. TEMPLETON
*. . . metallurgist, Alloy Steel*

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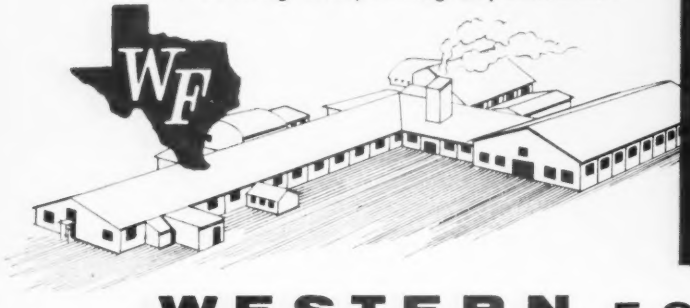
*Circle 625 on Inquiry Card—Page 217*

*specializing in fast, efficient delivery of castings to manufacturers of cooking and heating appliances.*

The Western Foundry Company was founded in 1943 and began operations with 25 employees. Today over 800 people turn out more than 10,000 burner and stove castings a day. The core room can produce 15 to 20 thousand cores per day. Cupola facilities have a 250 ton per day melting capacity. Western delivers to all points west of the Mississippi in the foundry's own trailer trucks. Shipments are also made to Canada, South America and the Caribbean. Services are complete from pattern shop thru foundry, finish machining and painting departments.



**WESTERN FOUNDRY COMPANY**
TYLER, TEXAS

# Western uses STANDARD silica

In creating highest quality, precision castings, Western Foundry Company uses STANDARD SILICA, the purest, most uniform silica sand in its core room. STANDARD SILICA insures that, when used with Western's own mixing formula, exactly the same superior castings will be formed with each pouring. M. A. Bell Company, serving Western Foundry Company's needs, is distributor for STANDARD SILICA COMPANY.

**STANDARD**
**Silica Company**
**OTTAWA • ILLINOIS**

*Silica Center of the World*

**LET STANDARD SUPPLY YOUR NEXT ORDER FOR SILICA SAND. LARGE QUANTITIES OR SMALL IT IS ALWAYS THE SAME EXCELLENT PRODUCT**

**PROMPT DELIVERY OVER TRUNK LINE RAIL FACILITIES**

● A. DALE MITCHELL
*. . . Waterbury Farrel pres.*

● JOHN E. GOTHERIDGE
*. . . Foseco service mgr.*

● JACK W. GIDDENS
*. . . technical service engineer*

● JOHN WATSON
*. . . Despatch Oven dept. mgr.*

joined Alloy Steel Products Co., Linden, N. J., in a similar capacity. He is a graduate of Colorado School of Mines.

● **A. Dale Mitchell** was elected president, Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., succeeding the late Joseph Schaeffer. **Fred S. Van Valkenburg,** with the company since 1910, and a vice president and director for several years, was elected chairman of the board, replacing **R. L. Wilcox,** who retired recently. Mr. Mitchell, formerly a public auditor and accountant, joined Waterbury Farrel in 1942 as assistant treasurer-comptroller, and became treasurer and a director in 1954.

● **J. J. Punke** was appointed executive vice president, Precision Castings Division of Harsco Corp., Syracuse, N. Y. The office of president was abolished upon resignation of W. J. During Sr. Mr. Punke joined Precision Castings Co. in 1937 and until recently was senior vice president in charge of engineering and manufacturing there.

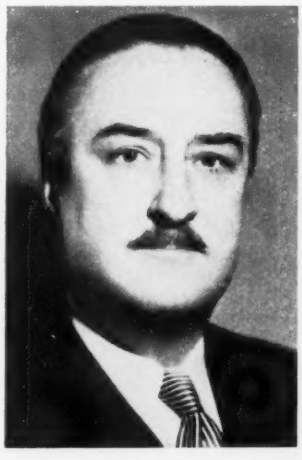
● **John E. Gotheridge** was named manager of an expanded technical service facility recently set up by Foundry Services Inc., Columbus, O. **Jack W. Giddens** was appointed technical service engineer. Mr. Gotheridge, a graduate of Birmingham Institute of Technology, Birmingham, England, served the company in metallurgical, research and field work until 1954, when he was transferred to United States. Mr. Giddens was graduated from Tri-State College and until recently was plant manager, Yale & Towne Mfg. Co., Franklin Park, Ill. Previous connections include Armour Research Foundation, Chicago, Perfect Circle Co., Hagerstown, Ind., and International Harvester Co., Indianapolis.

● **Harry H. Reich** and **Harry C. Reich** have been appointed representatives for Herman Pneumatic Machine Co., Pittsburgh, in North and South Carolina, Georgia, Florida, Alabama, Mississippi and Tennessee. The Messrs. Reich, with headquarters in Trussville, Ala., are southern manufacturers' representatives.

● **John Watson,** former manager of Despatch Oven Co.'s Chicago office, has been appointed manager of the firm's new industrial department in the Minneapolis home office. Since 1945 he has handled sales and engineering in the Chicago area. **Charles W. Rudolph** will continue sales and service activities there.

**Thomas G. Digges** was appointed assistant chief of the Metallurgy Division, National Bureau of Standards, Washington. A member of the division for 36 years, and acting assistant chief since 1950, Mr. Digges will continue as chief of the Thermal Metallurgy Section.

● **Frank W. Krohn** was appointed field engineer in the Detroit district, Norton Co., Worcester, Mass. He was



● J. J. PUNKE
*. . . Precision Castings v. p.*

● HARRY H. REICH
*. . . Herman Pneumatic sales*

● HARRY C. REICH
*. . . Herman representative*

● FRANK W. KROHN
*. . . Norton Co. sales, Detroit*

*how to make your cupola operation more efficient*

**WHITING CORPORATION**
HARVEY, ILLINOIS

Another WHITING Service

BULLETIN NO. FO-1

nearly anyone can obtain

# Cupola Output

but it takes cupola specialists to make operation profitable!

Basically a cupola has always been a relatively simpl melting unit. Yet, the full potential output and qualit of melt from a cupola is not always obtained. Usuall there is more to cupola operation than "meets the eye and Whiting analysis and engineering assures peak pe formance instead of average or below average result

If you are planning the installation of a cupola now in the near future, or even if you believe your cupola operating successfully, it will definitely pay you to co sider the latest developments that "tailor" the cupo to meet your particular metal requirements. Whitin has made many advancements, not only in cupola d sign but also in equipment used in conjunction wit cupolas, that lead to better metal at lower costs.

In designing and planning a new cupola, for exampl the application of scientific principles in constructio and arrangement of tuyeres is necessary to provide th proper volume of air to the coke bed. Tons of coke day can be wasted through mis-use or improper arrang ment of tuyeres. Blast, blowers and many other oper tion factors should be investigated. Bottom door hois and props, blast pressure gauges, blast line check valve front slagging spouts, windbox vent valves, drop r moval cars, water cooling and slag disposal are also be considered.

Fortunately, a great deal can be accomplished with o cupolas. Usually they can be easily modified to incorp rate the latest Whiting cupola accessories. This w result in increased cupola effectiveness, higher outp rates and adherence to quality standards for molt iron. For seventy-two years Whiting has engineered a manufactured cupolas and cupola accessories. Whiti engineering service includes (1) analyses of requi ments, (2) layout and selection of equipment, (3) ma ufacturing supervision, (4) supervision of erection, ( initial operation, and (6) periodic field checkups. Ta over your plans now with a Whiting engineer!

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**WRITE FOR THESE INFORMATIVE BULLETINS**

Here are seven bulletins from Whiting's extensive library on cupola design and operation that will help you in considering improved methods and ways for obtaining maximum output from your cupola. Send for any or all of the bulletins you need—today! When ordering, please specify by "FO" number shown.

FO-7 Cupola blast control

FO-3 Hot-blast

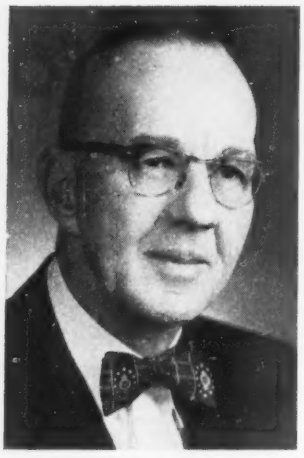
FO-5 Here's ho to save melting fuel

FO-9 Review of foundry-cupola gasses and temperatures

FO-2 Tips on improving cupola charging

FO-8 Suggestions solving some cupo operation problem

## MEN OF INDUSTRY



● TODD W. FREDERICKS
*. . . general sales mgr.*

● RAYMOND H. FILSINGER
*. . . assistant v. p. sales*

● HARRY E. ORR
*. . . engineering sales v. p.*

● JOHN H. ALLISON
*. . . Simonds Worden White v. p.*

graduated from Brown University and was formerly a member of Norton's sales engineering department.

● **Todd W. Fredericks** was appointed general sales manager, Centr-O-Cast & Engineering Co., Detroit. Mr. Fredericks has been associated with the aluminum industry for 25 years in sales and engineering.

**C. A. Pickett,** vice president-general manager, Illinois Engineering Co., Chicago, subsidiary of American Air Filter Co., Louisville, was named manager of AAF's sales department within the Product and Marketing Division. **John J. Willis,** assistant manager of the Heating and Ventilating Products Department of AAF, was transferred to Illinois Engineering Co., as sales manager and assistant to the general manager. **John W. Frazier,** AAF assistant to the director of sales, was appointed sales promotion manager.

**J. Thomas Coggin** was named manager of product engineering at the Elmira, N. Y., foundries of General Electric Co., Schenectady, N. Y. He continues in charge of the foundry laboratory.

**Lewis A. G. Martorano** was elected assistant treasurer, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. He was formerly associated with Lybrand, Ross Bros. & Montgomery, Philadelphia accountants.

**Harry Keck** was appointed sales representative in the Chicago area, Lewis-Shepard Products Inc., Watertown, Mass. He joined the organization in 1950.

**Malcolm Petrie** was appointed assistant sales manager, Shell Process Inc., West Springfield, Mass.

● **Harry E. Orr** was appointed commercial vice president in charge of engineering sales, and **Raymond H. Filsinger,** assistant vice president-sales, Vanadium Corp. of America, New York. Mr. Orr, who was assistant vice president and manager of engineering sales in the Chicago office, will now be located in Pittsburgh. Mr. Filsinger, formerly district manager in Pittsburgh, has been transferred to the New York office.

**Dr. William D. Walther** heads the Research and Development Division recently established at Dayton Steel Foundry Co., Dayton, O. Dr. Walther, who received his doctorate from Massachusetts Institute of Technology, was previously in the scientific laboratory of Ford Motor Co., Dearborn, Mich. **Eugene M. Mitchell,** for 11 years special representative for the company, was named assistant sales manager and will head up a new program of market development, working closely with the Research and Development Division. He is a graduate of University of Dayton. **Harold G. Melia** heads the new Industrial Engineering Division, in charge of the standards and statistical department. He is also a University of Dayton graduate. **Richard Walther,** with the company since graduation from Ohio State University in 1951, replaces Mr. Melia as personnel director.

**Joseph J. Murray,** formerly assistant general sales manager, was named manager of the New York industrial lift truck sales and service branch, Materials Handling Division, Yale & Towne Mfg. Co., Philadelphia. He joined the company in 1933 and headed the New York operation from 1949 to 1951 during an expansion program.

● **John H. Allison** was named vice president - sales, Simonds Worden White Co., Dayton, O. He has been engaged in the company's sales activities for 25 years.

**George J. Baurle** was appointed sales engineer, Oberdorfer Foundries Inc., Syracuse, N. Y. He will cover the western New York-western Pennsylvania territory for Oberdorfer and its subsidiary, Oswego Castings Corp., Oswego, N. Y. Mr. Baurle was associated with American Bosch Division, American Bosch Arma Corp., Springfield, Mass., for 22 years. **Robert V. G. Grodkowski** recently joined Oswego Castings Corp., as a die cast engineer. He joined Monarch Aluminum Mfg. Co., Cleveland, in 1948, after graduation from Illinois Institute of Technology.

**Joseph F. Ramey** was named Boston branch automotive and industrial trades sales manager, Coated Abrasives Division, Minnesota Mining & Mfg. Co., St. Paul, succeeding **John H. Hargreaves,** who retired after 34 years of service. Mr. Ramey joined the company in 1948 and became a member of the coated abrasives sales force the following year. In 1955 he was named the division's eastern region sales supervisor.

**R. F. Knobloch** was appointed midwestern belting sales engineer for the conveyor and elevator belting department, United States Rubber Co., New York, with headquarters in Chicago. He was previously sales engineer in the Passaic, N. J., office of the belting department.

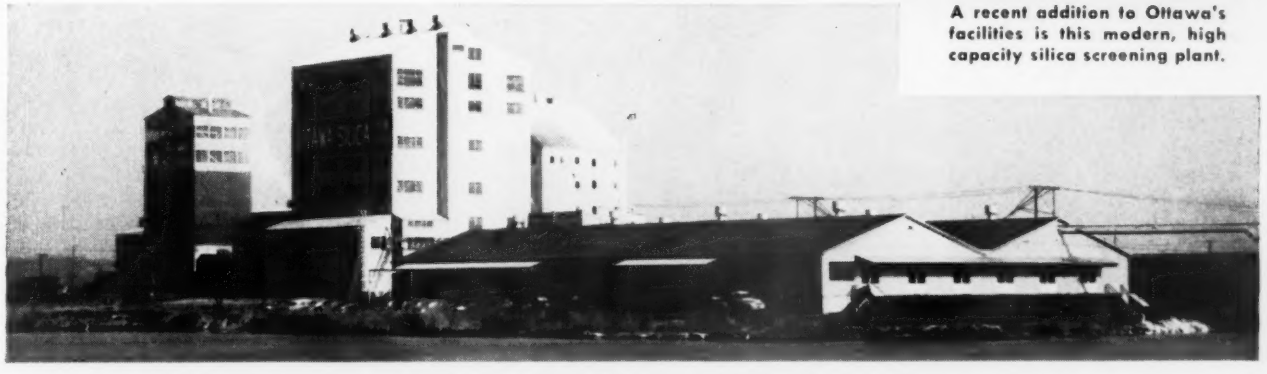
**Charles G. Chisholm** was named general sales manager, Haynes Stellite Co., Kokomo, Ind., division of Union Carbide & Carbon Corp., New

# 6500 tons of silica sand daily!

## The LARGEST SINGLE operation of its kind in the United States

Ottawa's tremendous processing facilities are housed in two plants located on a 1000 acre quarry site of St. Peter's sandstone. This deposit rates as one of the purest and most extensive of its kind in the whole world. These huge mills house the most complete and modern refining processes in the industry and they operate around the clock to supply silica products to all corners of the earth.

A recent addition to Ottawa's facilities is this modern, high capacity silica screening plant.



A view of Ottawa Silica Company's Mill B, showing the new screening plant, grinding plant, portion of the original screening plant, warehouse and shop. The extensiveness of plant area and the most modern methods of sand processing make practically all grades of silica available for swift delivery. New plant additions in the past five years have resulted in a potential increase of 1500 tons of silica sand daily.

# OTTAWA

## SILICA SANDS

Serviced by two main trunk railway systems, Ottawa offers fast delivery to all corners of the nation.

**99.89% PURE**

Laboratory tests prove Ottawa Silica 99.89% pure.

Periodical improvements and plant additions are in line with a long established policy at Ottawa Silica Company. Constantly increasing industrial requirements for our fine silica sands have prompted this growth.

When you buy Ottawa silica you can be sure that you have bought the best available anywhere. Our policy also prescribes top product quality as well as ample facilities for providing prompt delivery.

Get the habit of saying "Ottawa" when you buy silica. You'll be pleased with the product and the service.

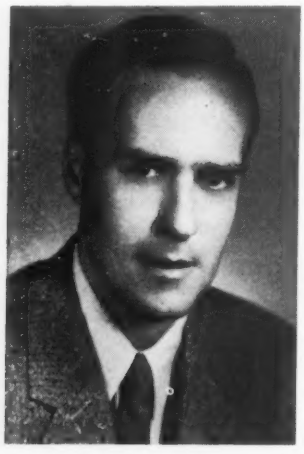
**OTTAWA SILICA COMPANY**

PLANTS LOCATED IN
OTTAWA, ILL. AND ROCKWOOD, MICH.

***SERVING THE FOUNDRY, GLASS AND CERAMIC INDUSTRIES FOR OVER 50 YEARS***

York. A graduate of Lafayette College, he joined Haynes Stellite in 1933. In 1936 he was transferred to the sales department to develop sale of corrosion-resistant alloys. For several years he has been sales development manager for investment castings and high-temperature and corrosion-resistant alloys.

● **James E. Hays,** formerly furnace engineer, Foster Forbes Glass Co., Marion, Ind., was appointed Indianapolis sales representative, Laclede-Christy Co., St. Louis, division of H. K. Porter Co. His territory will include parts of Kentucky, Virginia, Ohio, Indiana and Illinois. Mr. Hays is a graduate of Purdue University.



● JAMES E. HAYS
. . . *joins Laclede-Christy*

**Ralph C. Hanson,** until recently with E. J. Lavino & Co., Philadelphia, recently joined the Ramite Co., Chicago. He will work out of the company's Pittsburgh office as a special representative co-ordinating sales.

● **R. A. Willson,** for the last 4 years district manager in the Los Angeles office, Wright Hoist Division, American Chain & Cable Co., York, Pa., was appointed district manager of the New York and New England territories. Mr. Willson joined Wright as a salesman in the Texas territory in 1949 after graduation from Tri-State College.

● R. A. WILLSON
. . . *Wright Hoist district mgr.*

**C. J. McDowell** was named eastern regional sales service manager, Corn Products Refining Co., New York, with headquarters in New York. Other appointments as sales service managers with their respective locations include: **R. F. Cohee,** central, Chicago; **R. D. Walter,** southern, Memphis, Tenn.; and **E. W. Beardsley,** western, San Francisco.

**Richard Reiss** and **Henry Levesque** were named assistant sales managers, Baird Associates-Atomic Instrument Co., Cambridge, Mass., to direct sales of the company's spectrographic equipment.

**William R. Fiand** recently joined Electro Metallurgical Co., division of Union Carbide & Carbon Corp., New York, as sales-service representative in the Pittsburgh district office.

**Hugh Richmond** was named supervisor of sales engineering, eastern sales division, Hyster Co., Portland, Oreg. With the company since 1951, recently he was a sales engineer at the Danville, Ill., plant. **Thomas Davis,** who joined Hyster in 1950, and obtained sales experience in the Chicago office, was named a sales engineer in the eastern industrial truck division.

● **N. H. Hobbie,** since 1950 assistant sales manager in the Charlotte, N. C., district sales office of Air Reduction Sales Co., New York, was named district manager there, succeeding the late J. B. Davenport. **J. S. Stevens,** former zone manager in the company's railroad department, has taken over Mr. Hobbie's duties as assistant sales manager. Mr. Hobbie was graduated from Roanoke College and joined Airco in 1945 as a salesman at Birmingham.

● N. H. HOBBIE
. . . *Airco district mgr.*

**Robert N. Smaistrla** was appointed district sales manager in Houston, Tex., Laclede-Christy Co. Division, H. K. Porter Co., St. Louis, in the territory including southern sections of Texas and Louisiana. A graduate of Rice Institute, he was formerly sales service engineer, M. H. Detrick Co., Chicago.

**Kenneth M. Stuerman** was appointed sales representative, Walsh Refractories Corp., St. Louis, in greater St. Louis, southern Illinois and Missouri. He has been with Walsh 9 years. **S. McCord,** with the company 4 years, will handle sales in Moline, East Moline and Rock Island, Ill., and Davenport, Iowa.

**Paul Schwartz** has joined the supervisory staff of St. Louis Steel Casting Co., St. Louis, as assistant to the plant superintendent.

**Robert E. Woods Jr.** recently joined the sales staff of St. Louis Coke & Foundry Supply Co., St. Louis.

**Sam Gurley Jr.** was made vice president-sales, H. K. Porter Co., New York. He recently held a similar position with Reichhold Chemicals Inc., New York. Previously he was associated with Borden Co.'s Chemical Division, and Barrett Division, Allied Chemical & Dye Corp., both of New York. Mr. Gurley is a graduate of University of Missouri.

**John M. Krno** was appointed manager, bulk sales development, Corn Products Refining Co., New York. **David E. Linn** succeeds Mr. Krno as manager of sales service. Mr. Krno, who is also a vice president of Corn Products Sales Co., has been with Corn Products since 1917. Mr. Linn, with the company since 1930, was assistant manager of the sales service department.

**Edward V. Schuerer,** manufacturer's agent, was named district representative in Wisconsin and Michigan's upper peninsula for Torit Mfg Co., St. Paul, with headquarters in Wauwatosa, Wis.



Circle No. 629 on Inquiry Card→

# Season's Greetings

from

## INTERNATIONAL MOLDING MACHINE CO.

IN THE FIELD . . .

THE EAST — Red Dorlman, Alexander Haigh, Bert Troy, Ed Neumann, Jack Mooney

THE WEST — Johnnie Russo

THE SOUTH — Ray Fringe

THE SOUTHWEST — Gene Silva

All from M. A. Bell Co.

NORTH AND CENTRAL — Joe H. Rooney, Earl J. Rooney, H. K. Matthews, W. H. (Bill) Stoker, John A. Sharretts, Jack Sharretts, Carl Beers

AT THE PLANT . . .

Blanche, Larry Pitmon Jr., Ted Eichler, Frank Hosek, Tom Wright, George Davis, Henry D. James Jr., Larry Del Mar Rudman

# INTERNATIONAL MOLDING MACHINE COMPANY

LA GRANGE PARK, ILLINOIS

Newly elected officers of the society include the following, from left to right: A. H. Renfrow, secretary; Henry J. Trenkamp, treasurer; Albert M. Nutter, vice president; J. Scott Parrish, president; and Cecil R. Garland, assistant treasurer

# GRAY IRON FOUNDERS

## *Look to Market Expansion*

By FRANK G. STEINEBACH
*Editor*

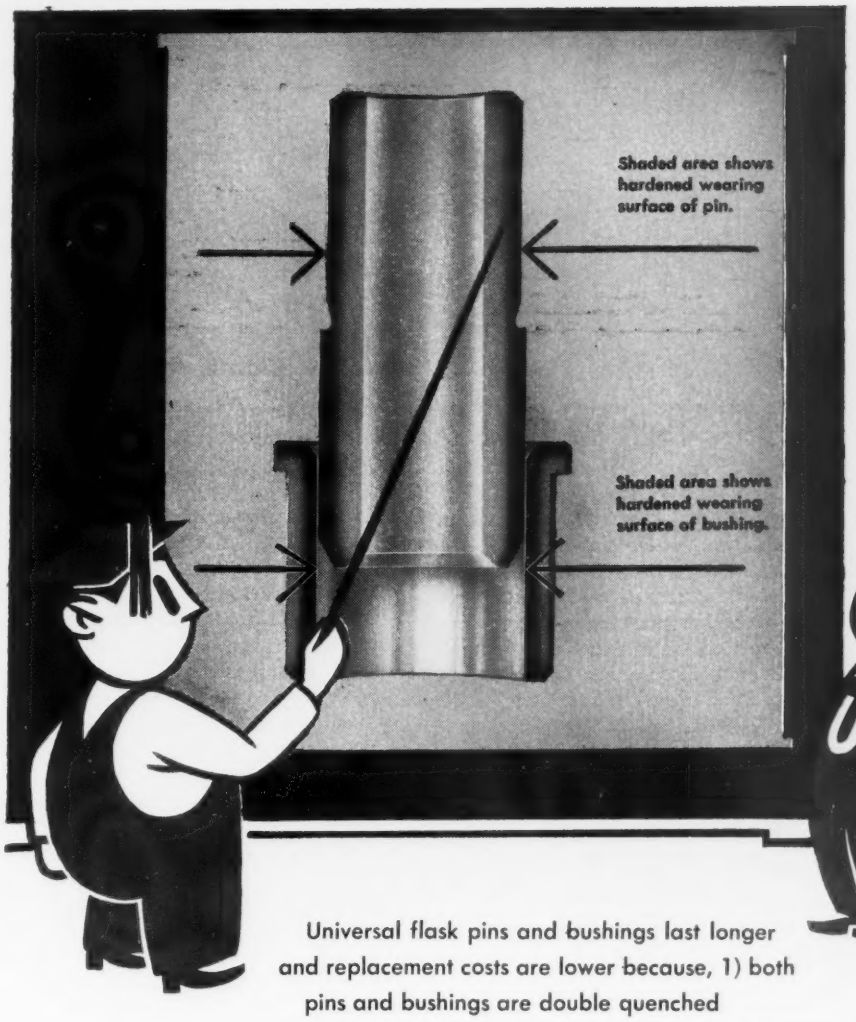
EXPANDING the markets for gray iron castings keynoted the sessions at the 28th annual meeting of the Gray Iron Founders' Society held at the Homestead, Hot Springs, Va., Nov. 1 and 2. Plans for the marketing program of the society, which got underway during the past year, and preliminary reports on market research surveys recently conducted by the society provided much of interest for the large representation of members in attendance.

In discussing the new marketing program, William S. Thomas, vice president, Emmaus Foundry & Machine Co., Emmaus, Pa., and chairman of the GIFS Marketing Committee, stated that although the gray iron industry has made great progress in the production of castings, it has not kept pace with many other industries in educating and selling customers. He emphasized that the industry must prove that gray cast iron is a basic material which has a rightful place in our economy. Only by this method can the peaks and valleys in demand be ironed out. Although the educational program must be national in scope, Mr. Thomas believes that each foundry must get the story over if maximum benefits are to be secured.

Richard C. Meloy, marketing director of the society, stated that business is good, that 1956 will be one of the three highest production years in history, and that 1957 promises to be sufficiently better to push production over 15 million tons of gray iron castings. Analyzing castings shipments by types of castings, Mr. Meloy showed that miscellaneous gray iron castings have not kept pace with the growth in population.

This lag may be due partly to the tremendous impact of new materials and new methods which have replaced gray iron in some cases. It also is due to the competitive battle in customer industries to lower

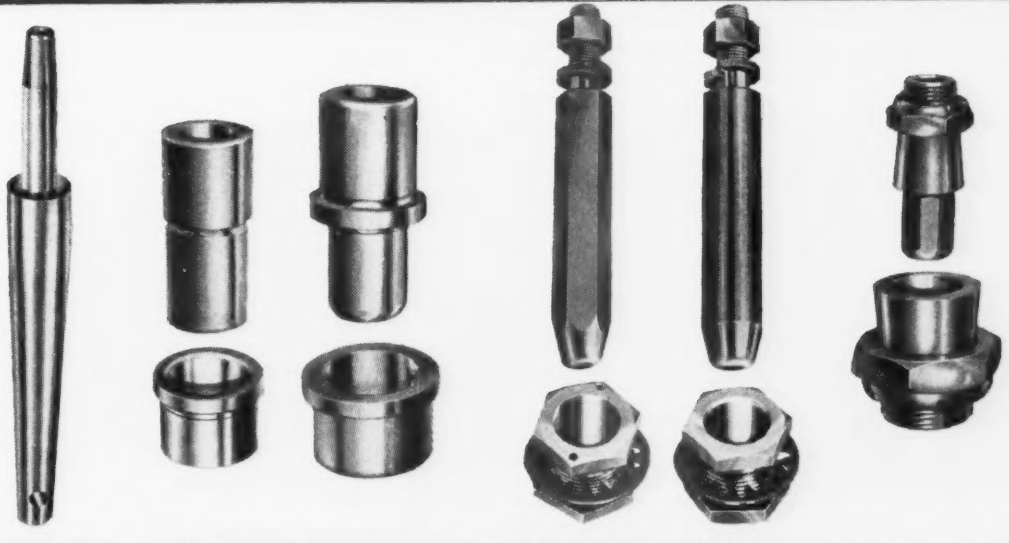
Peter E. Rentschler, right, received the gold medal of the society from Hermann P. Good. It was awarded for outstanding service to the society




# how the long life of UNIVERSAL flask pins and bushings saves dollars in your foundry operations

Universal flask pins and bushings last longer and replacement costs are lower because, 1) both pins and bushings are double quenched and double drawn to produce strong, ductile cores that can take rough treatment in the foundry without breaking or chipping and, 2) wearing surfaces are carburized and hardened to withstand wear. Universal flask pins and bushings are precision ground to insure instant, accurate alignment of cope and drag. For complete information, write to Universal Engineering Sales Co., 1060 Broad St., Newark 2, N.J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.

185



**UNIVERSAL ENGINEERING COMPANY** FRANKENMUTH 4, MICHIGAN



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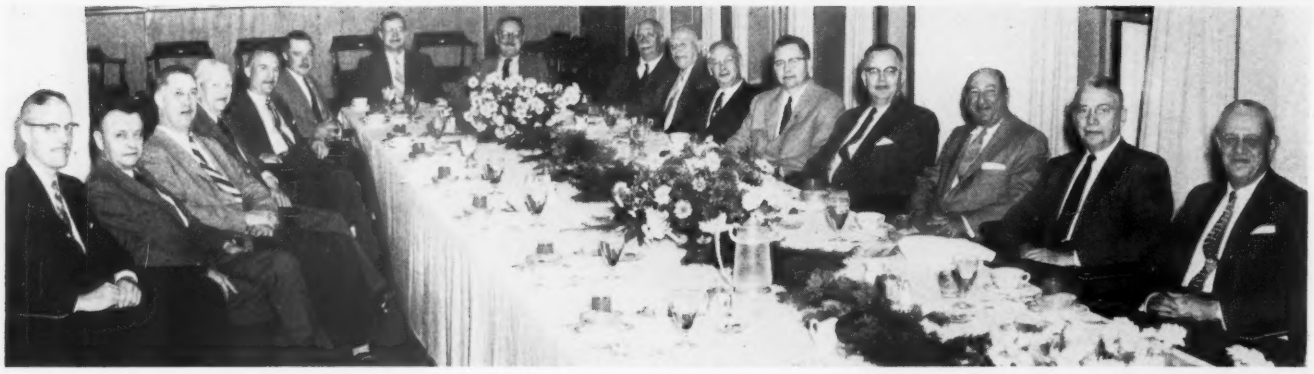


Directors of the society met at a luncheon gathering held prior to the official opening of the meeting. A number of guests also were present

weight and cost, which is a necessary, built-in part of our economy. But Mr. Meloy emphasized that the industry is not wholly dependent on the whims of others. Through product development, better sales and marketing practices, better service to customers and education of customers and potential customers, much can be done to mold the future progress of the gray iron foundry industry.

The presentation of information developed from the market surveys of purchasing agents, design engineers, and gray iron foundrymen proved exceptionally interesting. For example, purchasing agents indicated that the most important service foundries can render to customers concerns patterns, and they believe that considerable improvement is possible in that area. Although machinability was labeled most important, appearance, dimensional accuracy and specified strength also were rated as decidedly important. Larger buyers attach even more importance to special dimensional accuracy and specified minimum strength than other buyers.

This survey showed that 70 per cent of the purchasing agents prefer quotations based on price per piece rather than price per pound. In order of importance, 41 per cent indicated quality, 27 per cent price, 24 per cent delivery, 7 per cent service and 1 per cent engineer help. The widening field served by the individual foundry was emphasized by the fact that 49 per cent of purchasers come from foundries located less than 50 miles from the customer, 36 per cent from 50 to 200 miles, and 15 per cent from more than 200 miles. Purchasing direct from foundries was indicated by 97 per cent of the purchasing agents. Much more interesting information and comments of those participating in the survey were included in the presentation.

The survey on "How can foundries aid product engineers?" showed that only 14 per cent have casting specialists in their engineering departments. Of those replying, 62 per cent stated that there definitely is a place for foundry assistance in the design or redesign of products, and 31 per cent indicated there probably is a place. More calls by gray iron foundrymen are indicated since 64 per cent reported no calls during the past three months, 15 per cent had had one call, 9 per cent two calls and 12 per cent three or more calls. A group of questions covering technical information on gray iron indicated that many engineers must be told more about the products of gray iron foundries if they are to use them properly.

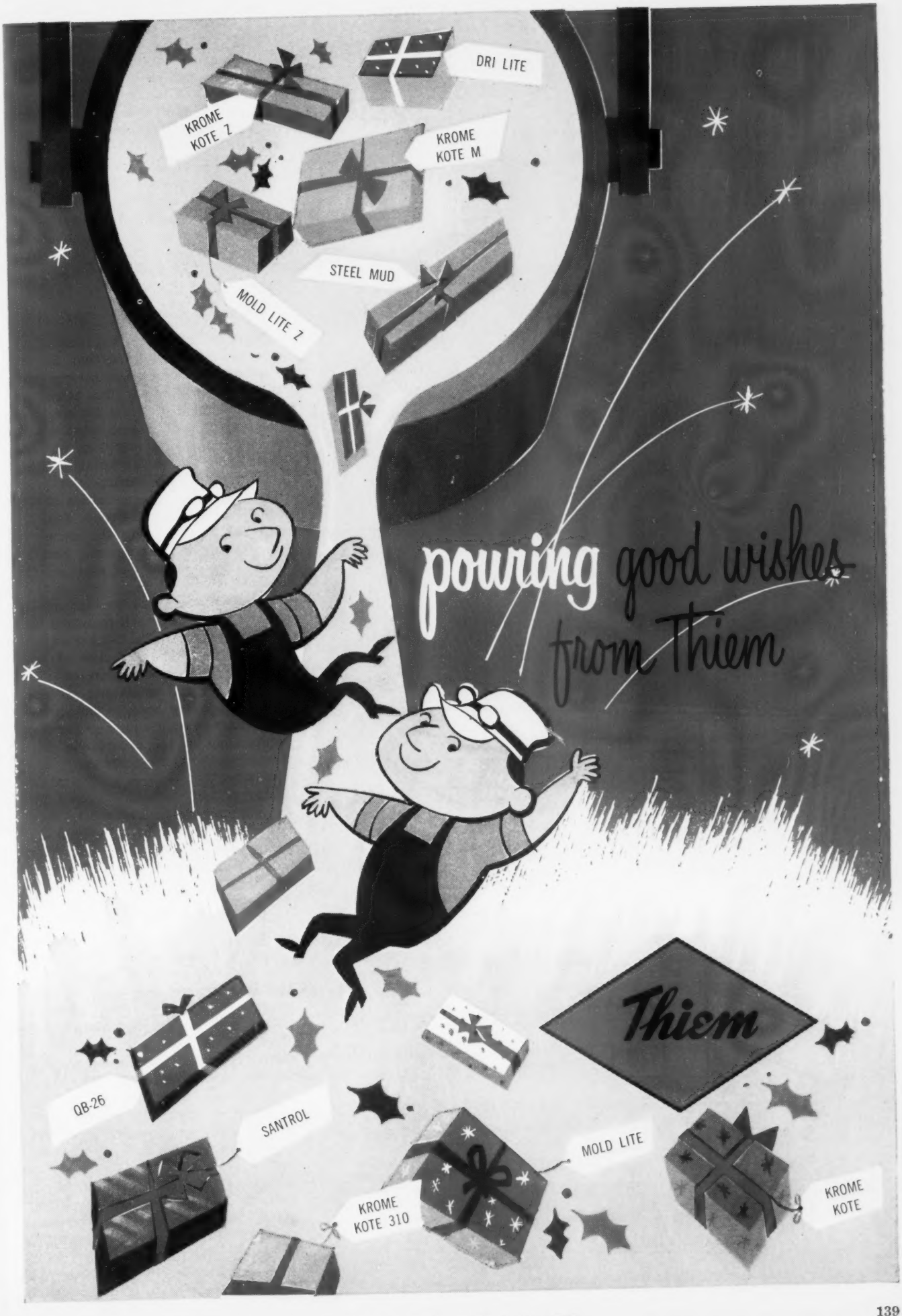
Mr. Meloy stated that the results of the survey of purchasing agents have been mailed to all members, and that results of the survey of product designers and foundrymen would be distributed shortly. In addition, detailed information on how to apply this information to the sales problems of the individual foundries will be sent to all members and discussed in regional meetings.

J. E. Rohrer was awarded $500 for winning first prize in the society's redesign contest. Charles H. Ker, retiring president, made the award

### Safety Committee Reports

Reports of other committees showed that the Safety Committee will push a program which will concern itself with the management approach to safety. The Terms and Conditions of Sale Committee reported the production of a booklet, "Engineering and Purchasing Requirements for Gray Iron Castings," which, it believes, will in addition to its prime purpose of permitting the foundry to quote more intelligently, provide an ideal piece of literature to build the prestige of gray iron castings as an engineering material. The Joint Handbook-Technical Committee reported progress on the remaining chapters and stated that the handbook should be published by the summer of 1957.

The Cost Committee reported establishment of a local cost group



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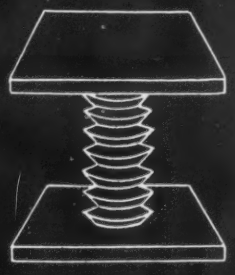
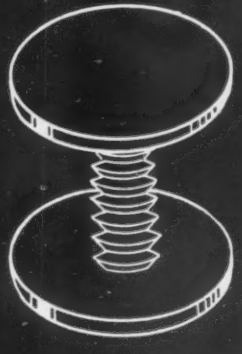
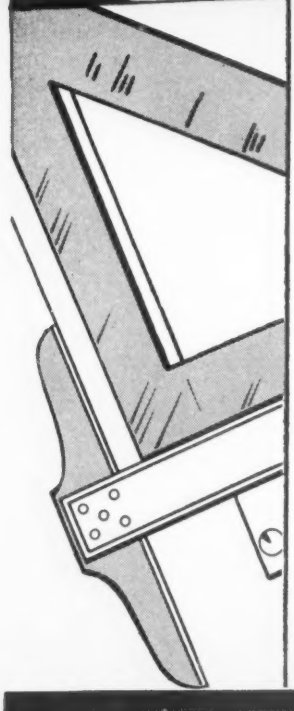
MILWAUKEE
DOUBLE HEAD
CHAPLETS



STEM DIA.
1/8" to 1 1/4"



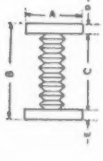
DESIGNED IN A VARIETY OF HEAD SIZES AND GUAGES TO MEET ALL CORE AND MOLD CONDITIONS



Sharp Threads-Metal Starts Knitting at Edges

Many Threads to Knit and Fuse

Threads from Head to Head Chaplet Fuses Evenly



Tolerance Variation Held to Strict Minimum

A Complete Line-
All Sizes of Stems, Heads;
Square, Round, Curved

**Milwaukee Chaplet & Mfg. Co.**
1025 SOUTH 40th STREET • MILWAUKEE 46, WISCONSIN

in Toronto. A new publication containing about 50 articles on costing which have been presented in *Gray Iron News* will be published. Preparation of Cost Manual No. 3 on Cost Control has been started. After presenting the Cost Committee's report, A. E. Hageboeck, Frank Foundries Corp., Moline, Ill., was highly commended by resolution of the Board of Directors for his contributions to the cost work of the society over a period of many years. Mr. Hageboeck is retiring as chairman of the Cost Committee, but will continue as a member.

**Society Protests Scrap Export**

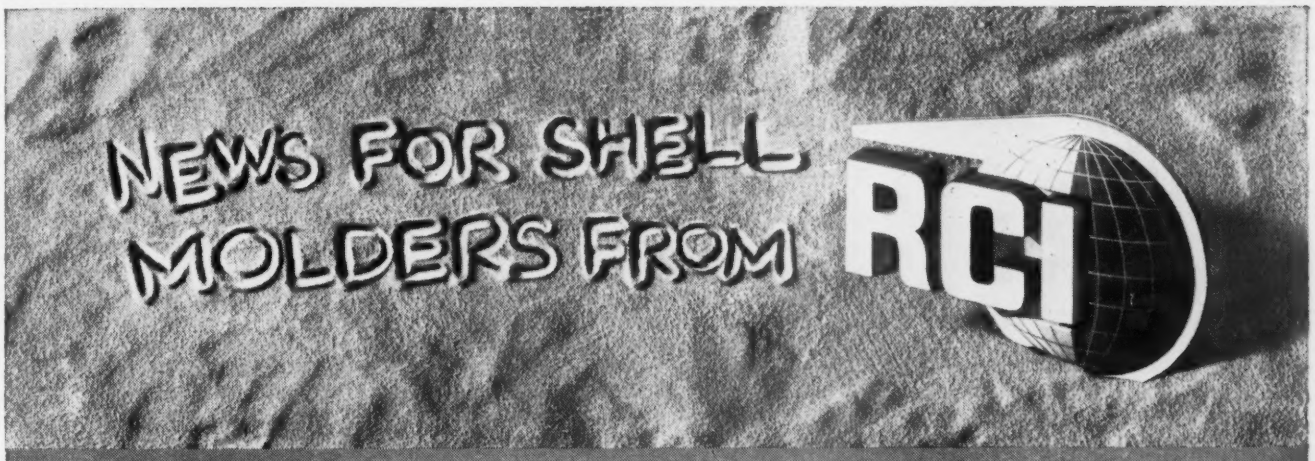
Donald H. Workman, executive vice president, reported that despite a substantial increase in society dues and despite the fact the attractive new marketing program did not start functioning until a few months ago, the society had a net loss of only eight foundries in the voluntary resignation category during the year. He reported on the activities of the GIFS and other ferrous foundry societies in protesting the excessive exportation of ferrous scrap and indicated the possibility of some restrictions.

Mr. Workman also touched on the trend toward increased tonnages produced by fewer units, but stated that forecasts of general industrial confidence and growth promise more business for the small and medium-sized companies because industry is depending on their suppliers for more components in the prosperous years ahead.

Charles F. Walton, technical director, told of the problems that have delayed the production of the handbook and outlined the material now being prepared by a number of outside organizations. He also discussed his work with other societies, including ASM, in the revision of the handbook.

During the past year a summary of specifications of gray iron castings has been collected and published. Mr. Walton also has been connected with joint committees of ASME and ASTM and the research program of AFS. E. Harold Mitchell, field director, reported on the functioning of various local groups of the society.

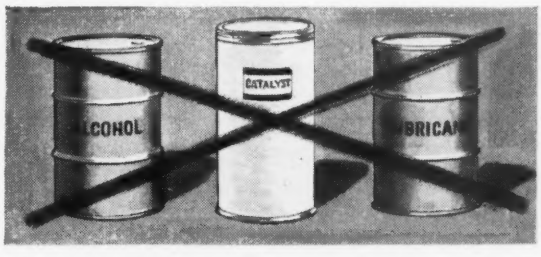
J. Scott Parrish Jr., president, Richmond Foundry & Mfg. Co., Richmond, Va., was elected president, succeeding Charles H. Ker, president, Dalton Foundries Inc., Warsaw, Ind. Albert M. Nutter, treasurer, E. L. LeBaron Foundry Co., Brockton, Mass., was named vice president, A. H. Renfrow, partner-general manager, Renfrow Foundry, Los Angeles, was made secretary, and Henry J. Trenkamp, president, Ohio




# New RCI system simplifies cold coating of sand

**May be used for producing shell molds or shell cores by dump box or blowing methods**

Now, with the new RCI system, *all you need is two materials* for cold coating sand (besides the sand). One is a powdered phenolic resin, RCI FOUNDREZ 7555. The other is an alcohol solution of a phenolic resin, RCI FOUNDREZ 7150.




*No longer do you need to purchase and handle alcohol, catalysts, lubricants and so forth.*

**Amount of resin needed:** The amount of resin required for a given mix will, of course, depend on whether you are coating sand for dump-box operation or for blowing shells and cores (and will vary considerably with the type of sand used). But the experience of RCI Technical Service men in the field indicates that for shell cores about 2-4% resin will be satisfactory. For dump-box operations or blown shells a range of 3-5% will generally be enough.

## Other Advantages of RCI coating system

1. **Speed of coating**—release of alcohol from the resin itself accelerates actual coating of the sand. You cut mulling time about 35 to 45% . . . **reduce resin dust, too.**
2. **Strength of bond**—because the RCI system coats more efficiently than the powder and alcohol method, you get greater dry tensile strength (on an equal solids basis). You also get better economy and reduced gas content.
3. **Rate of production**—lowered investment time as well as cure time with this system gives you a higher rate of production for both cores and molds.
4. **Release characteristics**—you will find a marked improvement in the ease with which cores and molds are released from the boxes and patterns.
5. **Resin stability**—both the powdered resin, FOUNDREZ 7555, and the liquid resin, FOUNDREZ 7150 are very stable. You can store them for long periods of time (the powdered resin kept cool and dry to prevent lumping).

**Write for full information.** If you would like to know the procedure and typical formulations for simplified cold coating with the new RCI system, write today for *Technical Bulletin F-10.*

*Creative Chemistry . . .*
*Your Partner in Progress*

RCI

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Synthetic Resins • Chemical Colors • Industrial Adhesives • Plasticizers
Phenol • Formaldehyde • Glycerine • Phthalic Anhydride • Maleic Anhydride
Sodium Sulfite • Pentaerythritol • Pentachlorophenol • Sulfuric Acid

**REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.**

GLOBE
SILVERY IRON
FERRO ALLOYS

Silvery Pig Iron

Originated 84 years ago, Globe Silvery Pig Iron has remained in a class by itself. It provides accurate silicon control with all grades ranging from 6 to 16% silicon.

A skilled metallurgical staff is available to help you select the correct grade for your specific requirements.

- Made from all-virgin ore.
- Uniform structure — uniform melting and even silicon distribution.
- Readily identified and easily handled by magnet or hand.

Serving Industry Since 1883

PM

PICKANDS MATHER & CO.
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Chicago • Cincinnati • Detroit • Duluth
Erie • Greensboro • St. Louis • Washington

IRON ORE • PIG IRON
COAL • COKE • FERROALLOYS

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Foundry Co., Cleveland, was elected treasurer. Cecil R. Garland, W. O. Larson Foundry Co., Grafton, O., was made assistant treasurer.

New members of the board of directors include Hermann P. Good, division manager, Textile Machine Works, Reading, Pa.; L. Earl Paltenghi, vice president, H. C. Macaulay Foundry Co., Berkeley, Calif.; A. Lysle Dyer, plant manager, Buckeye Foundry Co., Cincinnati; J. Edward Quest, secretary - treasurer, J. F. Quest Foundry Co., Minneapolis, and president, Shakopee Foundry Co., Shakopee, Minn.; and William A. Hepburn, vice president and treasurer, John T. Hepburn Ltd., Toronto. Donald H. Workman, executive vice president, and Charles F. Walton, technical director, were reappointed for another year.

### Honor Members for Service

Peter E. Rentschler, president, Hamilton Foundry & Machine Co., Hamilton, O., was presented the gold metal of the society for outstanding service to the society and the industry as chairman of the Terms and Conditions of Sale Committee for many years, and for his leadership in progressive foundry management with particular reference to good housekeeping, safety practices and improved industrial and public relations.

Mr. Rentschler also served the society as president in 1936-38; a member of the executive committee for three years and a director for six years.

Other members of the industry also honored and presented with a beautifully illuminated scroll for outstanding service and unselfish devotion to the advancement of the industry were Summerfield Brunk, president, Headford Bros. & Mitchins Foundry Co., Waterloo, Iowa; Ray T. Lewis, secretary and sales manager, Keen Foundry Co., Griffith, Ind.; James W. Simmons Jr., vice president and treasurer, Cox Foundry & Machine Co., Atlanta; and E. J. Bothwell, International Nickel Co., New York.

Cash prizes were presented to three foundry executives, winners in the Redesign Contest of the society. Top award of $500 went to J. E. Rohrer, buyer, New Holland Machine Division of Sperry Rand Corp., New Holland, Pa.; second prize of $250 to R. C. Mueller, sales engineer, Universal Foundry Co., Oshkosh, Wis., and the third prize of $100 to V. Gleasman, Cleveland. Honorable mention was won by William S. Thomas, vice president, Emmaus Foundry & Machine Co., Emmaus, Pa., and Norman J. Petitte, Superior Foundry Co., Cleveland.

GLOBE
SILVERY IRON
FERRO ALLOYS

Ferroalloys

Ferrosilicons
High-Carbon Ferrochromes
Low-Carbon Ferrochromes
Low-Carbon Ferrochrome Silicons
Silicomanganese
Other Speciality Alloys

The most modern in the country, Globe's new plant at Beverly, Ohio, is ideally situated to distribute its diversified ferroalloy products by rail, water and truck.

It is staffed by highly competent operators, research and metallurgical engineers who are available for consultation on your needs.

Serving Industry Since 1883

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PICKANDS MATHER & CO.
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Chicago • Cincinnati • Detroit • Duluth
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IRON ORE • PIG IRON
COAL • COKE • FERROALLOYS

Circle 635 on Inquiry Card—Page 217

**AS PARTNERS IN YOUR PROGRESS . . .**

# OUR CONSCIENTIOUS SERVICE – is a *plus* factor!

Our service engineers are thoroughly familiar with electrothermic and electrochemical operations. They are competent to render high level technical advice to electrode, anode, carbon brick and mold stock customers.

The alertness of these service engineers in anticipating customer needs and wishes is a characteristic *plus factor* in the trustworthiness of GLC carbon and graphite products.

The high degree of integration between discoveries in our research laboratories, refinements in processing raw materials and improved manufacturing techniques is further assurance of excellent product performance.

ELECTRODE GLC® DIVISION

## Great Lakes Carbon Corporation

**GRAPHITE ELECTRODES, ANODES, MOLDS and SPECIALTIES**

ADMINISTRATIVE OFFICE: 18 East 48th Street, New York 17, N. Y. PLANTS: Niagara Falls, N. Y., Morganton, N. C. OTHER OFFICES: Niagara Falls, N. Y., Oak Park, Ill., Pittsburgh, Pa. SALES AGENTS: J. B. Hayes Company, Birmingham, Ala., George O. O'Hara, Wilmington, Cal. SALES AGENTS IN OTHER COUNTRIES: Great Northern Carbon & Chemical Co., Ltd., Montreal, Canada; Great Eastern Carbon & Chemical Co., Inc., Chiyoda-Ku, Tokyo, Japan

# Industry Briefs

**PETTIBONE MULLIKEN CORP.,** Chicago, is acquiring the Mercury Mfg. Co., Chicago, by an exchange of stock. Mercury has been in business in Chicago for nearly 50 years and manufactures tow tractors, electric lift trucks and trailers. It will be operated in its present location with the same personnel and distributors as at present. E. J. Seifert, president, Pettibone Mulliken, will become chairman of the board of Mercury.

**Federated Metals of Canada Ltd.,** division of American Smelting & Refining Co., New York, has opened the second of two new Canadian nonferrous metal fabrication, processing and refining plants. Located on a 9-acre tract in the Montreal suburb of Lachine, the new facility includes some 40,000 sq ft of floor space. Federated recently opened another plant in Toronto.

**Crucible Steel Co. of America,** Pittsburgh, has acquired the entire interest of National Research Corp., Cambridge, Mass., in Vacuum Metals Corp., Syracuse, N. Y., which now becomes a wholly owned Crucible subsidiary. Vacuum Metals was organized by National Research in 1946, and Crucible purchased a 50-per cent interest in 1954.

**Koehring Co.,** Milwaukee, has changed the status of Kwik-Mix Co., Port Washington, Wis., a wholly owned subsidiary, to that of a division. Kwik-Mix, manufacturer of power wheelbarrows and cement mixers, will be known as Kwik-Mix Division. No personnel changes are involved.

**Baker-Raulang Co.,** Cleveland, has named Miami Fork-Lift Truck Inc., Miami, Fla., to distribute its line of industrial trucks in southern Florida. Baker-Raulang also has moved its Dallas, Tex., branch office to a new building at 1703 Levee St., Dallas 7. M. S. Stevenson, formerly a district sales manager, has been appointed manager of the Dallas branch.

**Electro Metallurgical Co.,** a division of Union Carbide & Carbon Corp., New York, has opened a new eastern sales office in Phillipsburg, N. J., at Roseberry and Marshall Sts. These activities formerly were located in New York City. The telephone number is Phillipsburg 5-6403.

**Koppers Co.,** Pittsburgh, has named Longenecker Associates, Pittsburgh, to be its representative for two major products of its Metal Products Division, dust filters and mechanical dust collectors, in eastern Ohio, northern West Virginia and western Pennsylvania.

**Solvent Service Inc.,** Painsville, O., specialists in chemical and hydraulic cleaning and descaling of industrial equipment, has acquired the accounts of Lemont Chemical Co., Lemont, Ill.

**Metal Treating Institute,** Rochelle, N. Y., reports that 1956 billings of its members through September were 24.8 per cent ahead of those for the like 1955 period. Total for the first nine months of 1955 was $22,050,400, compared with $27,508,100 this year.

**Flynn & Emrich Co.,** Baltimore, is increasing output at its foundry at Grantley Road and Western Maryland Railway by about 10 per cent. Coreroom equipment is being installed in a recently completed addition.

**Burnham Pattern Works,** Milwaukee, held an open house on Oct. 6 to mark completion of an expansion program. The expansion included doubling the floor space and adding new equipment to the firm's facilities.

**Joseph Dixon Crucible Co.,** Jersey City, N. J., has completed the first phase of a facilities expansion program for the manufacture of refractory products. This work involved construction of a new high-temperature kiln.

**Lindberg Engineering Co.** and **Lindberg Industrial Corp.** have consolidated all their operations in the Cleveland area at 1414 Victoria Ave. The telephone number is Academy 1-5576.

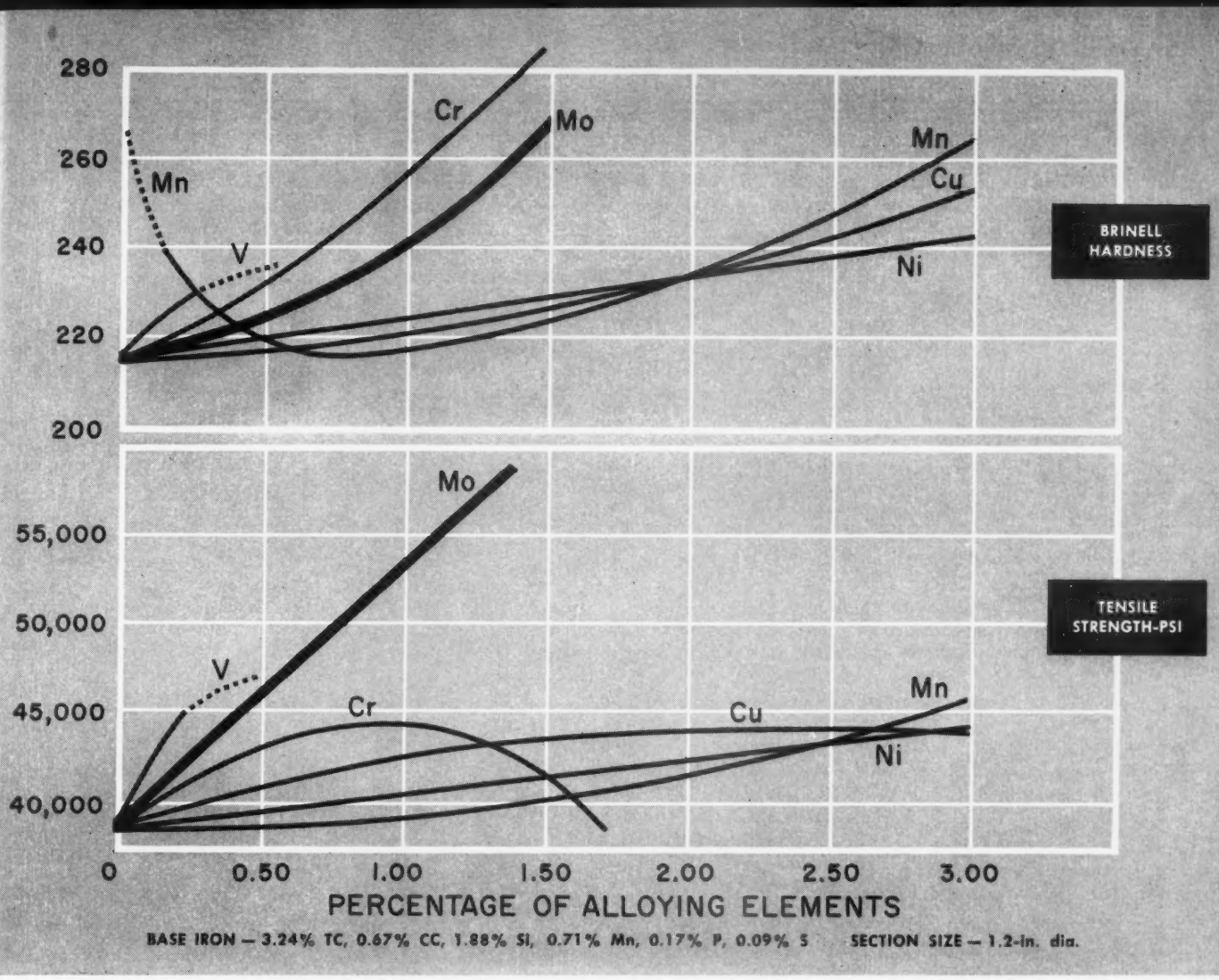
**Automatic Switch Co.,** Orange, N. J., has moved its Pacific Coast factory branch, including sales, service and stock facilities, to larger quarters at 1233 Goodrich Blvd., Los Angeles, Calif.

**Baroid Division, National Lead Co.,** Chicago, has moved its bentonite sales office to Room 1864 McCormick Bldg., 332 South Michigan Ave., Chicago 4, Ill. The telephone number is Harrison 7-8656.

**Precision Dies & Castings Ltd.,** Toronto, Ont., Canada, has been acquired by Jack Kent Cooke, Toronto, who paid nearly $4 million for Precision and two plastics plants.

**Yale & Towne Mfg. Co.,** Philadelphia, has named Cardinal Carryor Co., 930 East Mason St., Louisville,

TRIPLES PLANT FACILITIES: Sutter Products Co., manufacturer of foundry machinery and other equipment, has moved to a 44,000-sq-ft building at Hadley and Grant Sts., Holly, Mich. The Holly plant more than triples present plant facilities in Dearborn, Mich. The move is part of a continuing program of expansion and diversification. Management and staff of the company will be enlarged to produce a broadened line of foundry equipment and services




Note how additions of moly, up to 1.5%, produce proportional improvements in strength. And, with moly, hardness increases much more slowly. It means higher strengths can be used with less danger of impaired machinability.

# each ½% Moly adds 7000 psi to strength of cast iron...

A little moly adds a lot of strength — for molybdenum increases strength more than any other common alloying element, with the exception of small vanadium additions. A rule of thumb is that fifty points of moly raise tensile strength 7000 psi. And without sacrificing toughness. Actually, moly improves toughness at least as much as strength.

What's more, versatile moly aids in obtaining uniform response to heat treatment . . . and in producing machinable, growth-resistant castings. Moly is easy to use, too. With most grades of cast iron, moly requires no change in the character of the charge, normal melting practice, or the base metal. And foundrymen like the fact that the small additions necessary may be made at the spout or in the ladle.

Write now for "Why Moly Iron". It's the full story of how and why moly adds strength faster than hardness, how it increases fatigue and torsional strength—in short why moly makes better cast iron. Climax Molybdenum Co., Dept. 20, 500 Fifth Avenue, New York 36, N. Y.

**CLIMAX MOLYBDENUM**

Circle 637 on Inquiry Card—Page 217

to be franchise representative for the sale and service of its industrial lift trucks.

**Baker-Raulang Co.,** Cleveland, has named Bohnert Equipment Co., 104 West Main St., Louisville, Ky., to distribute its line of material handling trucks.

## Uses of Coated Abrasives Are Demonstrated at Show

Significant new techniques in the coated abrasive grinding and finishing of metals were demonstrated at Cleveland the week of Oct. 29 to an estimated 3000 production men from all phases of the metalworking industry and all parts of the country.

The occasion was the second National Metalfinishing Show, sponsored by Behr-Manning Co., Troy, N. Y., a division of Norton Co., at the abrasives manufacturer's clinic rooms, 4101 West 150th St. Purpose of the exhibit was to provide a clearing house of information and education on the many new developments in a technology which is expanding rapidly. The exhibit consisted of nearly 100 machine tools and metalworking machines, most of them developed within the past two years and many shown for the first time. They were the products of 34 manufacturers who were guests of Behr-Manning Co.

First day of the event was devoted exclusively to editors of the metalworking and business press. Throughout the remainder of the week, the show was open to industrial production men.

Scores of these visitors brought actual workpieces for comparative testing on new equipment which ranged from huge automatic machines destined for automobile and appliance production lines, to small specialty tools for such exacting work as removing defects from the contoured surfaces of jet engine blades.

Specialty machines developed for grinding and finishing aircraft and engine components accounted for the presence of representatives from several West Coast plants. One of the largest automobile companies assigned its abrasives technicians to a two-day stay at the show, and a Rochester, N. Y., distributor underwrote the trip for customers who filled two railroad cars.

Features of the show included lecture-demonstrations by Behr-Manning Co. scientists and engineers, and the showing of a new color film on the uses of abrasive discs in metalworking.

# 80-Year-Old Stove Still in Daily Use

By DEWAR FORBES

This iron stove was cast 80 years ago by Rathbone Sand & Co., Albany, N. Y. It won a first prize at the Philadelphia Centennial Exposition in 1876 and still is in daily use

ALTHOUGH Nevada is the sixth largest state in the Union in area, it has only two small foundries within its boundaries. Carson City, the state capital, is, however, the home of a notable example of the art of the iron foundry, a cook stove more than 80 years old. Judging from the visitor's book, it has been admired by artists and foundrymen from all over the nation.

Carson City is in the region of the famous Comstock Lode, which was discovered in 1859 and yielded a total of more than $1 billion worth of silver and gold. In the Carson City area stand some of the mansions built by men who became wealthy in that famous strike, mansions which contain from 20 to 35 rooms and from 6 to 10 bedrooms.

The Rinckel mansion, a solid brick building on a granite base, is in as good condition as when it was built in 1874. Elaborate furnishings from all over the world filled its many rooms, as they do today. And still in use in the kitchen is the cook stove, which was awarded a first prize at the Centennial Exhibition in Philadelphia in 1876. Whoever made the patterns for the stove must have been an artist as well as a capable patternmaker, and the foundry did a perfect job.

The stove was made by Rathbone Sand & Co., Albany, N. Y. It has four doors with elaborate scenes on them, as clear as the day they were made, which depict the four seasons. Spring is represented by a cherub releasing a bird, summer by a cherub with a wreath of flowers, autumn by a cherub with a sickle and cut sheaves of grain, and winter by a cherub warming his hands at a fire.

The large oven door portrays cherubs in a forest of oak trees with a goat whose reins are covered with roses. A lower door shows a cherub as a sculptor and another as an artist with his easel, painting.

Fire grates for wood or coal are provided, with firebacks of coils, and a copper boiler furnishes hot water.

I am indebted to Mrs. George Rinckel Blakeslee, a daughter of the pioneer owner of the mansion, for the accompanying illustration of the stove. Mrs. Blakeslee and her husband still occupy the mansion, and the stove is in daily use.

# DIE SET-UP

## *Easier! Faster! Safer!...*

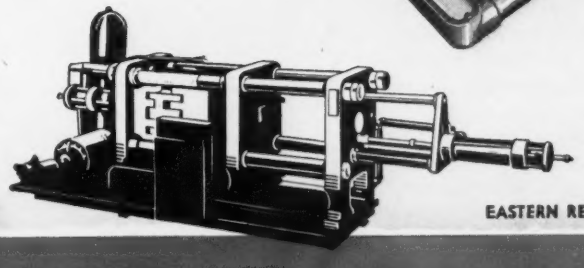
WITH

## CAST-MASTER

DIE-CASTING MACHINES

Built-in Rack and Pinion permits use of a ratchet wrench to quickly move the complete die-locking assembly in place to accommodate various sizes of dies.

Die-Lock Valve can be shut off and by-passed, with Inching Valve assuring added safety when setting up die. This permits instantaneous, micromatic control.



Faster set-up time is just one of the many "bonus" features which make Cast-Master today's outstanding choice in die-casting machines. To get the complete "bonus" story, send for the Cast-Master catalog, containing illustrations and specifications on eight new models.

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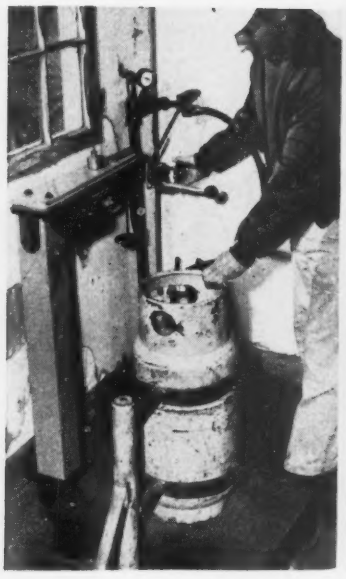
EASTERN REPRESENTATIVE: Milton Harmon, 18 Rock Road, Milford, Connecticut

**CAST-MASTER *Inc.*** 23901 AURORA ROAD BEDFORD, OHIO



At Gerber Products Co., flow of gas is cut off automatically when the tank contains 33½ lb

Maintenance costs were lowered 50 per cent on six fork trucks converted to liquefied petroleum gas by Korhumel Steel & Aluminum Co. Such savings result from the operating characteristics of the fuel

# L P G

## offers advantages as a

# FORK TRUCK FUEL

By RUSSELL HASTINGS
*Chief Engineer*
Industrial Truck Division, Clark Equipment Co.
Battle Creek, Mich.

ADVANTAGES claimed for liquefied petroleum gas as a fuel for fork lift trucks have excited a great deal of attention recently. Nonetheless, although the number of LPG users is growing steadily, there frequently is a lack of understanding as to how the advantages of LPG can be applied to specific handling problems.

**What is LPG?**—Liquefied petroleum gas is gas kept in a liquid state by pressure. It can be either propane or butane, but usually is a mixture of the two. Its chief source is natural gas, from which LPG is condensed out as a by-product. Large quantities also are produced by oil refineries as a by-product of gasoline production, and additional amounts, previously burned off as waste, are being realized from crude oil wells. LPG is measured in pounds; 4.46 lb equal 1 gal of gasoline.

**Characteristics of LPG**—LPG has certain characteristics which distinguish it from gasoline:

1. Propane boils at minus 44° F, whereas butane boils at 32° F. (It is because of this decided difference in vaporization temperatures that the two gases usually are mixed. Butane alone, for example, would not be effective in subfreezing temperatures.)

2. At 100° F, propane develops 172 lb pressure, whereas butane develops 38 lb pressure.

3. Octane rating of propane is 100; that of butane is 93.

These characteristics require slightly different construction in engines using LPG from that in gasoline engines. Because of the higher octane rating of LPG, a higher compression ratio—from 8 to 1 to 9 to 1—is used to obtain fuel economy.

A cold intake manifold is used with LPG since it is a gas when it enters the manifold and, unlike a gasoline engine, does not require a hot spot to help vaporization. A simple air-gas carburetor replaces the complicated, delicate gasoline carburetor.

Since LPG is a liquid only when under pressure, a fuel tank capable of withstanding high pressure is necessary. Clark's LPG fuel tanks, for example, are designed for working pressures of 240 psi with test pressures of 480 psi and incorporate a relief valve to by-pass and vent pressure exceeding 375 psi.

**Advantages of LPG**—Longer engine life is probably the principal advantage of the fuel. Operating characteristics of LPG result in reduced engine wear, compared to gasoline operation, and thus lower engine maintenance costs. Here's how this is accomplished:

Exhaust fumes produced by LPG are colorless, odorless, harmless, a factor in this food warehouse

1. LPG enters the combustion chamber as a gas rather than as a vaporized liquid, thus insuring almost complete burning. Unburned carbon deposits, common with gasoline, are eliminated almost entirely.

2. LPG's high octane rating allows



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# Save by using specialized refractories

Many refractories problems in metal-working furnaces have been solved *economically* by the use of B&W specialized refractory castables. Each ferrous or non-ferrous furnace application requires a specific combination of properties to meet the service conditions. Whether your problem is high temperatures, abrasion and erosion, slag attack or the need for insulation, to name a few, you will find the refractory castable best suited to your requirements in B&W's line. Shown here in digest form are data on the widely used B&W refractory castables for metal-working furnaces:

## B&W Refractory Castables for Metal Working Furnaces

| | Temp. F | PROPERTIES | TYPICAL APPLICATIONS |
|---|---|---|---|
| **B&W Kaocast** | 3000 | **High resistance to spalling and slag attack. Low volume change and negligible reheat shrinkage.** | **Soaking pit covers, linings of high temperature heating and forging furnaces, burner blocks, electrode linings of electric furnace roofs, linings of non-ferrous metal furnaces.** |
| B&W Kaocrete 32 | 3200 | High strength, exceptional refractoriness, unusual volume stability, excellent resistance to spalling. | Can be used in applications similar to those of B&W Kaocast and where higher refractoriness is required. |
| **B&W Kaocrete D** | 2500 | **Sufficient strength and hardness to withstand abrasion, considerable physical abuse and erosion.** | **Aluminum melting furnaces, linings and car tops in heat treating furnaces, as well as in sections of a wide variety of furnaces that are subject to scraping by hand tools or other mechanical abuse.** |
| B&W Kaocrete A | 2600 | Resists reducing atmospheres. Has good resistance to erosion, abrasion and thermal shock. | Annealing furnace bases and other applications where resistance to reducing atmospheres is essential. Also as a general purpose castable for linings in medium temperature service. |
| **B&W Kaocrete B** | 2300 | **Has an adhesive plastic texture particularly suited for vertical or overhanging constructions. Excellent for plastering.** | **Patching linings and baffles and for any application where plastering rather than gunning or casting is required.** |
| B&W Kaocrete LI | 2700 | High alumina content, exceptionally high strength for resistance to abrasion and erosion. | Aluminum furnace linings where high alumina content is important. |
| **B&W Kaolite 20** | 2000 | **Offers castable's fast, low cost installation plus insulation. Has refractoriness, light weight and low heat conductivity and, in addition, will resist reducing atmospheres. Can be poured or gunned.** | **Aluminum melting, heating and heat-treating, annealing and forge furnaces. Also for general maintenance and patching.** |
| **B&W Kaolite 22** | 2200 | **Has the same properties as B&W Kaolite 20. Can be used for higher temperatures but not in reducing atmospheres.** | |

Send for your copy of B&W Bulletin R-35. It gives additional information on B&W's versatile refractory castables.

**B&W REFRACTORIES PRODUCTS:** B&W Allmul Firebrick • B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick • B&W Refractory Castables, Plastics and Mortars • B&W Silicon Carbide

**BABCOCK & WILCOX**

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 161 EAST 42ND ST., NEW YORK 17, N.Y.
WORKS: AUGUSTA, GA.

R561

clean burning, thereby eliminating lead compound deposits in the combustion chamber. LPG is completely free of materials that cause varnish deposits.

3. Since LPG is a dry gas, no liquid washes down the cylinder wall lubricant. Crankcase dilution virtually is eliminated. This condition results in less wear on cylinder walls and bearings and in longer life for lubricating oils.

4. The simple carburetor has no jets or other mechanisms that require maintenance and adjustments like those usually necessary with a gasoline carburetor.

5. The fuel pump is eliminated because LPG is under its own pressure in the tank.

In most installations, lowered fuel costs are realized with LPG, but this saving depends largely on geographic location. Generally speaking, LPG costs less than gasoline in the western, midwestern, north-central and Gulf states. In the north-eastern states, LPG usually is more expensive. In the former areas, lower fuel costs will reflect especially substantial savings in fleet installations where fuel costs make up a large portion of the total operating cost.

Buying LPG in bulk rather than in individual tanks increases savings in the cost of fuel but requires storage facilities. Whether such action is economical depends on total fuel consumption.

**What About Fumes?**—The small amount of fumes produced by LPG combustion are colorless, odorless and harmless—an important factor in certain instances. Because of the almost complete burning of the fuel, exhaust fumes are produced to a much smaller extent than by gasoline engines. Carbon monoxide is contained in LPG fumes in only minute amounts due to the high volatility of LPG. For the same reason, odorous aldehydes—which give gasoline fumes their obnoxious smell—are nonexistent to any traceable degree in LPG fumes.

**Is LPG Safe?**—Much has been said, and misunderstood, concerning the safety of using liquefied petroleum gas. Its characteristic high volatility, and the fact that it must be kept under high pressure, have occasioned some misgivings about the possibility of explosions and other accidents.

Any fuel has an "accident potential," LPG not excepted. But experience has proved beyond question that use of LPG is no more dangerous than that of gasoline or, even, of diesel fuel when normal safeguards and good maintenance procedures are utilized.

Well-engineered components are essential for safety. Fuel containers

# Foundries Find Aeroquip Flexible Hose Lines Resist Heat, Vibration and Abrasion

**ALBION MALLEABLE IRON COMPANY USES AEROQUIP ON MANY TYPES OF FOUNDRY EQUIPMENT**

Albion Malleable Iron Company, Albion, Michigan, has long relied on the dependability and money-saving advantages of Aeroquip Hose and Reusable Fittings for hydraulic and other fluid lines on coremaking, molding, melting, heat-treating and finishing equipment.

Finishing Superintendent Ernie Sandelius says, "Aeroquip Hose is well suited to foundry applications because it resists abrasion, vibration, heat and other operating stresses better than anything we've used."

For full information on tough, long-lasting Aeroquip Hose Lines, call the Aeroquip Distributor listed in your Yellow Page Phone Book, or write us.

Aeroquip Hose Lines for foundry applications: **1525 or 2556 Hose** for air, water, oil lines up to 250 psi.; **1503 or 2651 Hose** for hydraulic, lube oil, fuel, air, water lines up to 3000 psi.; **1509 Hose** for hydraulic, air lines up to 4500 psi.; **1546 Hose** for fire-resistant hydraulic fluid lines up to 4500 psi.

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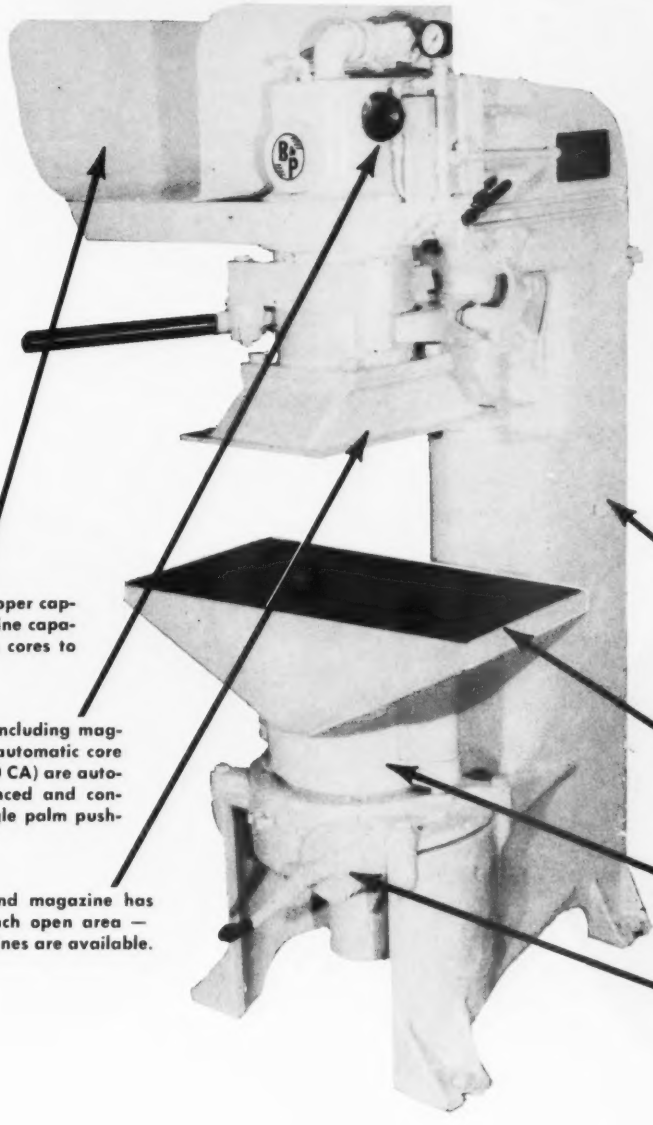
# NOW! Push-button coreblowing for *jobbing* foundry cores to 12 lbs.*



**CB-10 C FLEXIBLO**

**Full 100 lb. sand hopper capacity — 24 lb. magazine capacity — easily blows cores to 12 lbs. in weight.**

**All operations (including magazine refill and automatic core ejection on CB 10 CA) are automatically sequenced and controlled by a single palm push-button.**

**Standard sand magazine has full 7 x 12 inch open area — other magazines are available.**

**Rugged, all-cast construction ...strongest most rigid frame in the field.**

**11 x 32 inch table for handling large boxes — powerful air-on-oil side clamp available for vertically-split boxes.**

**Full 10-inch diameter draw cylinder with 4½-inch draw for handling boxes requiring a draw.**

**Table height is fully adjustable for boxes requiring less draw.**

**CAPACITY** No machine of similar size or cost matches the productive capacity of the CB 10 C Flexiblo. Here's a real production machine designed for jobbing or production foundry application. Every CB 10 C feature is designed to increase production and cut costs.

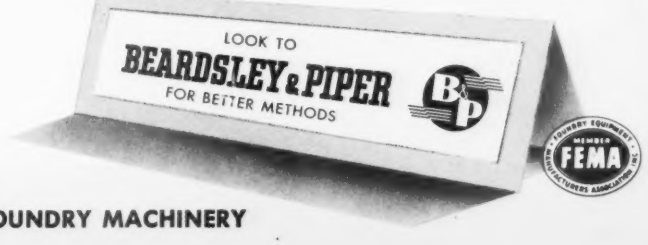
**FLEXIBILITY** This Flexiblo handles all types of core boxes — vertically-split, horizontally-split, or open face*— and with the CB 10 C quick-change blow plate, changes can be made in seconds. This Flexiblo is also fully adapted to the new "universal" blow plates.

**LOW COST** The CB 10 C Flexiblo is sold as a complete package, ready to operate. On the basis of production per dollar of investment, this blower is the best buy in the small blower field. Many special features designed to cut maintenance and downtime to a minimum mean further savings for you.

**EASE OF OPERATION** No other core blower approaches the Flexiblo for ease of operation. As with all Flexiblos, the CB 10 C combines safety and simplicity with push-button operation in the soundest blower design in the field. Automatic core ejector also available.

Write for Bulletin No. 5010 for the complete story

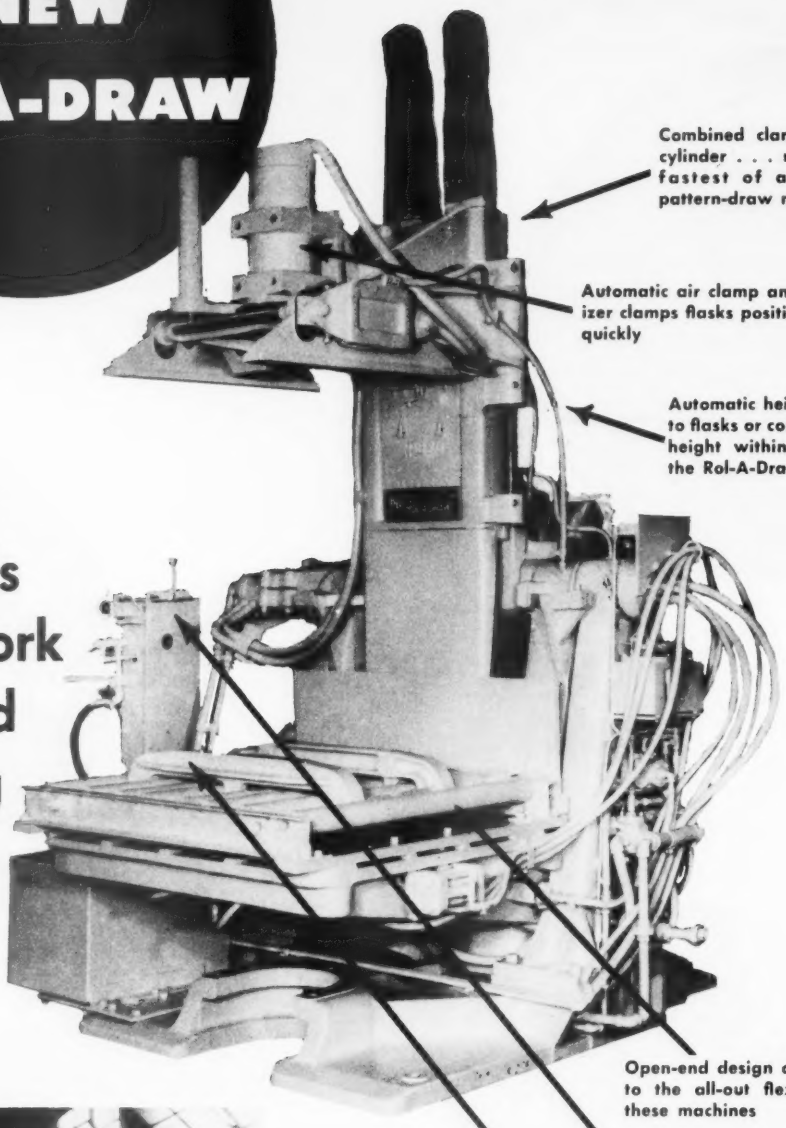
**Most of your existing **wooden** core boxes of good design as well as metal core boxes can be "Flexiblown"*




**THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY**

# A NEW ROL-A-DRAW

## that raises all standards for jobbing work molding and coremaking units



Combined clamp and draw cylinder . . . rollover is the fastest of any rollover pattern-draw machine

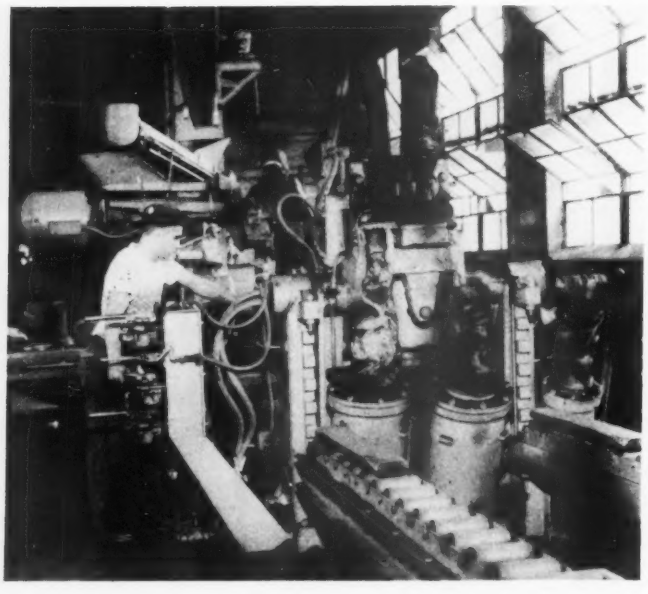
Automatic air clamp and equalizer clamps flasks positively and quickly

Automatic height adjustment to flasks or core boxes of any height within the range of the Rol-A-Draw

Open-end design contributes to the all-out flexibility of these machines

Pedestal mounting of all controls for convenience and simplicity of operation.

The most advanced pattern and core box clamp in the field — perfect for miscellaneous pattern jobbing work



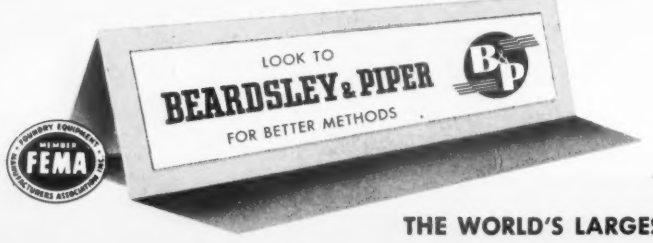
**NEED ALL-PATTERN FLEXIBILITY?** That's just what the Rol-A-Draw offers. Use existing patterns and core boxes — the Rol-A-Draw adapts itself to them.

**NEED INSTANT FLASK HEIGHT ADJUSTMENT?** No other machine adjusts to different flask or core box heights like the Rol-A-Draw. Adjustment is instant and automatic. An air-on-oil positioner and an automatic air clamp and equalizer assures instant adaptation to any flask height.

**NEED A FAST CYCLE?** None faster than the Rol-A-Draw. Combined clamp and draw cylinder and automatic cycle control assure minimum time cycles.

**NEED CAPACITY?** Rol-A-Draws offer capacities up to 10,000 lbs. They are ideally suited for installation with multiple-station slinger or other molding units.

Write for Bulletin No. 320 for full details




**THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY**

must comply with local regulations concerning the use of LPG. The tank should be equipped with a safety-relief valve which by-passes excess pressure. It is mandatory to have an excess flow valve on the tank which automatically shuts off the gas if the flow is too fast, as it might be if a coupling or hose is broken. Fuel systems should be sealed completely to eliminate fuel leakage or evaporation. Quick-disconnect, self-sealing couplers are important in that they help to prevent gas leakage during tank changeovers.

Since LPG is odorless, manufacturers add an odorant to aid in the detection of gas leaks. Often this odor occurs in the exhaust fumes and is ignored because it is considered natural. This belief is a mistake. Odorous exhaust fumes indicate that the odorant is not being burned completely, probably because the fuel mixture is too rich. This condition should be corrected immediately, not only for more efficient engine operation, but also because the odor might prevent detection of a similar one from a gas leak from the tank or hose couplings.

**Explosions Are Unlikely**

Although a gas leak is potentially dangerous, it by no means indicates an imminent explosion. To illustrate, let us assume that a tank valve has been damaged, resulting in a slow, steady leakage of gas. Ordinarily the leak would be detected either by the odor or by the sound made by the escaping gas. But in this case the leak has not been noticed, and an open flame is accidentally directed to the gas flow.

The result would be not an explosion, but a tongue of flame extending from the valve, much like an acetylene torch. Length of the flame would depend on the pressure behind the gas leak. Although the flame itself might cause damage or injury, there would be no explosion damage.

Such a leak might result in an explosion if the leak were undetected long enough for a sizable amount of gas to collect in a closed, unventilated area, such as the bottom of an elevator shaft, and then be ignited. While such a situation is possible, it is highly improbable if the LPG equipment is well constructed and in good repair.

Some gas usually escapes when fuel tanks are changed, but even this harmless amount can be reduced or eliminated with proper techniques. The shutoff valve on the tank should be closed completely during this operation. After the valve is shut, the fork truck engine should be run till it stops, thus using all fuel remaining in the fuel system. This relieves

# CANCER LIFE-LINE

In factories, plants and offices across the nation, the line is busy. Through films, pamphlets, posters, exhibits and lectures, the life-line of cancer education is reaching more and more men and women in business and industry.

All of us are concerned with the major threat which cancer poses. Today, thousands of lives are being saved each year, but many more would be saved if people went to their doctors *in time*. This, and many other facts of life about cancer, are part of the education program which the American Cancer Society offers you in your plant or factory. For additional information, call the American Cancer Society office nearest you, or write to "Cancer" in care of your local Post Office.

AMERICAN CANCER SOCIETY®

SHAKE-OUT VIBRATORS
*for all foundry applications*

**Write for complete specifications and prices.**

AIR OR ELECTRIC
PORTABLE OR PERMANENT
SILENT OR STANDARD

THE CLEVELAND VIBRATOR COMPANY

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pressure on connecting hoses leading from tank to metering device. If this procedure is followed correctly, there will be no "phfft" of escaping gas when the tank is removed. Two types of quick-disconnect couplers recently developed eliminate the need for running the engine overtime and also do away with the escaping gas.

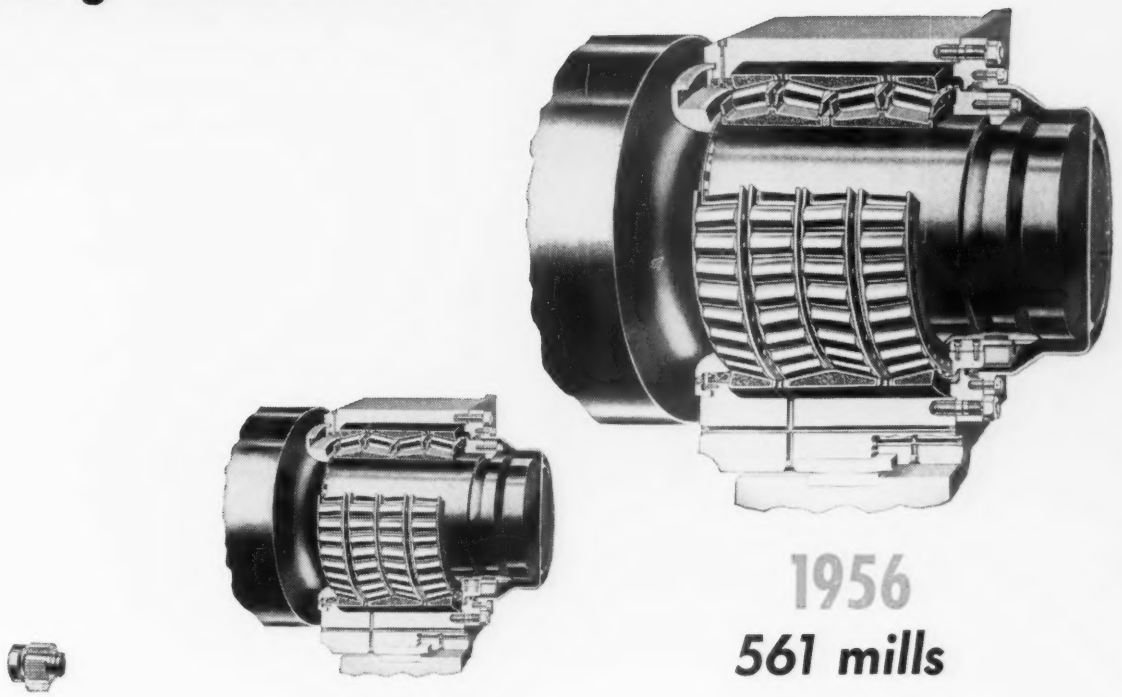
Most communities have local ordinances governing the use of LPG, and the first-time user of this fuel should consult these rulings to make sure his LPG operation is within regulations. Usually these codes demand that LPG be stored in an open area, away from general plant activity—a restriction often placed on other fuels or other inflammable materials. For more information about codes governing storage of LPG, refer to National Fire Protection Association pamphlets 58 and 59, and ASME Boiler Construction Code, Section VIII. Also see ICC regulations.

**Factory-Built or Conversion**—Some fork truck owners may not know that it is not necessary to purchase a machine factory-built for LPG operation to gain the advantages of this fuel. Most fork trucks now using gasoline can be converted to LPG operation at a reasonable cost. Clark, for example, has made available to its dealers a kit for shop conversion to LPG of all standard Clipper, Carloader, Yardlift 40 and Utilitruc model fork trucks. Some owners have purchased the kits to make conversions in their own shops, but most prefer that the work be handled by the fork truck dealer because of the complexity of the job. Owners of large fleets of fork trucks planning conversion to LPG will find it advantageous to have their own mechanics learn how to make conversions.

Since successful conversion depends on good workmanship and quality parts, the fork truck owner will be wise to insist on these requisites. Minimum conversions or short kit "spud-ins" not widely recognized or approved, or their components, should be avoided. All components used in conversion should have Underwriters' Laboratories approval if the user hopes to obtain reasonable insurance rates. (When converting fork trucks to LPG, one is wise to inform the fire insurance company to make sure that use of LPG does not alter insurance rates.)

Conversions of fork trucks to LPG should be made only on engines in top-notch shape. It is especially important that pistons, rings, valves and cylinder head be clean and free of carbon deposits. Gasoline, which causes carbon deposits, also acts as a solvent in keeping the deposits from becoming highly abrasive. LPG does not have this solvent effect, but

# TIMKEN® bearings used on rolling mill roll necks



1933
*45 mills*

1950
*317 mills*

1956
*561 mills*

# Look how this idea has grown in 23 years!

JUST 23 years ago—in 1933—there were 45 mills using Timken bearing-equipped stands. Today, 1354 Timken bearing-equipped stands are used in 561 mills . . . more than eleven times as many mills as in 1933.

Why has the idea of using Timken® tapered roller bearings on mill roll necks become so widely adopted? For all these reasons:

**1. LOW BEARING COST.** Tonnage records indicate that the long life of Timken roll neck bearings keeps bearing cost per ton of steel rolled to a minimum.

**2. GREATER MILL RIGIDITY.** Balanced proportion design of Timken bearings permits larger roll necks than ever before possible with tapered roller bearings.

**3. ELIMINATION OF COMPLICATED LUBRICATING SYSTEMS.** Timken bearings permit use of simple grease lubrication.

**4. LOAD RATINGS INCREASED UP TO 40%** due to Timken bearings' balanced proportion design.

**5. NO SPECIAL THRUST BEARINGS NEEDED.** Timken tapered roller bearings take both radial and thrust loads.

**6. MILLS CAN BE STOPPED AND RESTARTED WITH NO LOSS OF STEEL.** Timken bearings permit starting under full load.

**7. HIGHER ROLLING MILL SPEEDS** are possible because Timken bearings minimize friction.

**8. PROLONGED ROLL LIFE** is assured because Timken bearings provide maximum roll neck strength, less wear.

You can be sure of all these advantages in either existing or new equipment by specifying Timken tapered roller bearings for back-up and work rolls. Consult our roll neck bearing specialists for full details. Write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: TIMROSCO".

*This symbol on a product means its bearings are the best.*

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Super-Concrete Staves—virtually as hard and dense as natural stone—comprise the walls of Neff & Fry Bins (silos). The edges are tongued and grooved. The ends are diagonal so that surrounding hoops will impinge directly upon the horizontal joints.

Each stave is 10″ wide x 30″ long x 2½″ thick. Note particularly the thickness. It means a Neff & Fry Bin has great interior capacity in relation to external diameter. It also means a substantial saving of cement compared to that used in thick-walled concrete bins.

Because the staves have crushing strength of up to 8,250 psi, Neff & Fry bins carry heavy superstructures without additional supports—and that can save a large amount of construction cost.

Neff & Fry Bins don't rot, rust, spall, or burn. They never need face-lifting.

And these are just a few of the facts. If you knew them all, you'd certainly choose Neff & Fry Bins when you need facilities for handling and storing any kind of flowable bulk material. Ask us for complete information.

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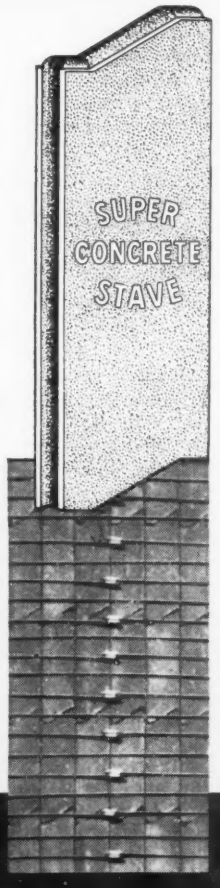


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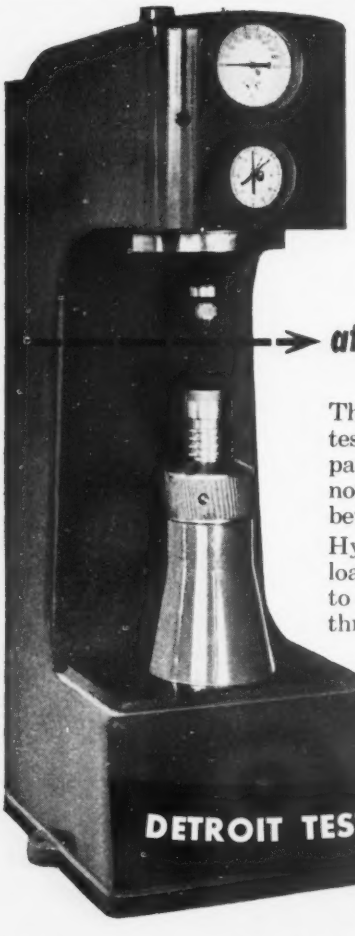

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This direct reading Brinell hardness tester tests round or flat parts *fast*. No grinding of parts is necessary and the operator simply notes that the dial indicator needle falls between pre-set tolerance hands.

Hydraulically applied standard Brinell test loads are used. Foot control allows operator to test parts as quickly as he can move them through the machine.

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tends to harden the residual carbon into a very abrasive substance. Therefore a good overhaul, or at least a thorough cleaning, is necessary for a proper conversion. For this reason a conversion usually can be done most economically at a time when the fork truck normally is due for an overhaul.

Since LPG, because of its high flame temperature, has a tendency to burn conventional valves, it is advisable to install stellite-faced valves and seats and positive valve rotators in the converted engine.

**Where Can LPG Be Used?**—A common misconception concerning use of LPG-powered fork trucks is that they are applicable only in very specific or specialized situations—those in which gasoline or electric-powered trucks are not practical for some reason.

The truth is that today LPG is used as a fuel in every industry in which fork trucks are utilized.

Of course, the fumeless characteristics of LPG make it an especially valuable fuel in certain industries, notably food processing and canning. But the combined advantages of LPG make it a fork truck fuel that can be utilized in any installation, as proved by the experiences of LPG users in a wide variety of applications.

For example, Douglas Aircraft Co., Santa Monica, Calif., recently published the results of a test made to determine the comparative advantages of propane and gasoline as fuels for fork trucks and towing tractors used in the plant. Douglas estimated that a fleetwide switch to LPG fuel would save $9560 a year.

A company long familiar with LPG as a fork truck fuel, Western Carloading Co., Los Angeles, reports that a converted unit operated 8000 hours before an overhaul was necessary and that even then the parts required cost only $35. Similar machines operating on gasoline required rebuilding at 2000 hours with parts and machine work costing $259.

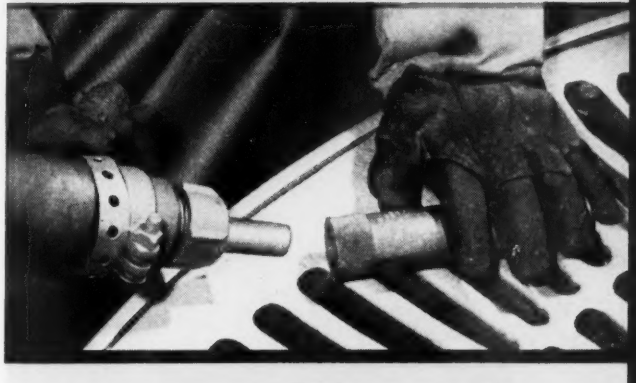
Some time ago, Korhumel Steel & Aluminum Co., Evanston, Ill., converted six of its 16 fork trucks at a cost of $1410. Seven months later the plant superintendent reported that "LPG has saved us at least $1800 in reduced maintenance and repair bills."

At the Elizabeth, N. J., plant of Burry Biscuit Co., several gasoline-powered fork trucks were converted to LPG for a three-month test period. At the end of that time it was established that maintenance savings of about $180 per truck per year could be expected. Results of the test period induced Burry to adopt LPG for its entire fleet.

# BLAST!

## BIG ones like this

or small ones, too! . . . . .



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Imitation, they say, is the most sincere form of flattery.Well then, it's small wonder that we're flattered.

Ever since 1939 when we developed and introduced MALLEABRASIVE, it's been imitated. Yes, imitated—*but never equalled!*

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## Conference at Illinois Tech Will Cover Cost Control

Application of scientific management to cost control will be featured at a Cost Control Conference to be held at Illinois Institute of Technology, Chicago, Dec. 6 and 7.

The conference is ninth in a series devoted to time study, material handling, wage incentives, work and measurement study, quality control, methods improvements, systems and procedures and similar subjects. It is sponsored by Illinois Tech's industrial engineering department and National Center for Education and Research in Dynamic Equipment Policy.

Conference director is Dr. Henry Ludmer, associate professor of industrial engineering. Site of the meeting will be the IIT Commons Building at 3200 South Wabash Ave. More than 500 management representatives are expected to attend.

## Form Provides Data for Proper Quoting on Gray Iron Castings

The Terms and Conditions of Sale Committee of the Gray Iron Founders' Society, Cleveland, has drawn up a form entitled "Engineering and Purchasing Requirements for Gray Iron Castings" to provide data to enable member foundries to quote properly. Bulk printing is planned to fill the requirements of members.

Editorship of the publication is credited to Warren W. Brown, vice president of sales, Carondelet Foundry Co., St. Louis. Information concerning prices to members is available from GIFS, National City-East Sixth Bldg., Cleveland 14, O. Single copies are available to nonmembers.

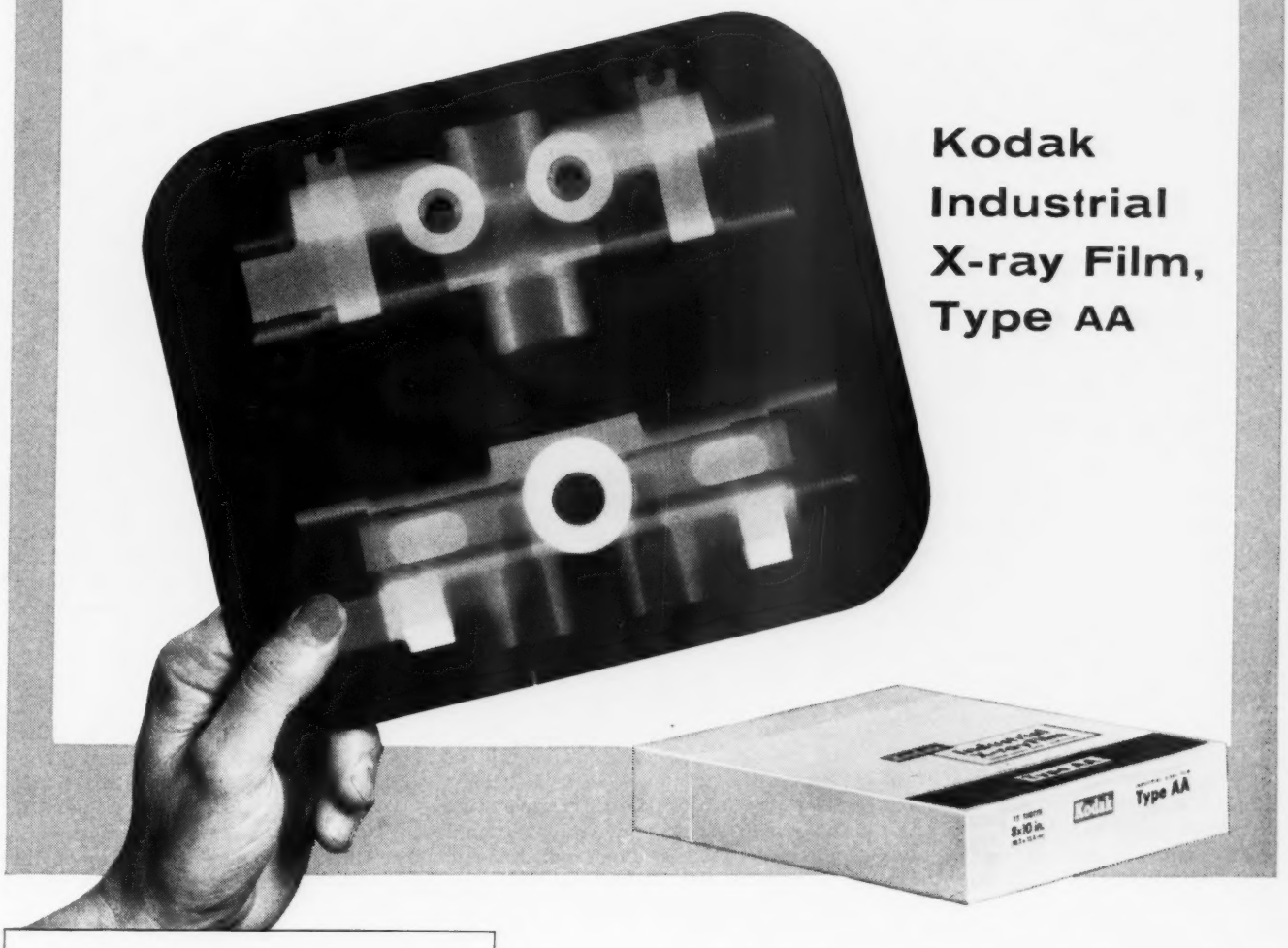
## Plant Maintenance Conference Offers Session for Foundries

Sixty-two of the nation's foremost authorities on keeping factories running will lead discussions at the eighth Plant Maintenance & Engineering Conference at the Public Auditorium, Cleveland. The conference will be held in conjunction with a record-breaking show during the first three of its four days, Jan. 28-31.

A session devoted to "Maintenance in Foundries" will be offered Tuesday, Jan. 29, at 9:30 a.m. Chairman will be John A. Pruessner, project maintenance, Sandusky Foundry & Machine Co., Sandusky, O., and the speaker will be S. A. Simonson, plant engineer, Chicago Hardware Foundry Co., North Chicago, Ill.

# New X-ray Film

## gives greater detail with usual exposure times

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Now your x-ray dealer can supply you with this new x-ray film that gives you greatly increased speed. This gives you the opportunity of using reduced kilovoltage to obtain greater radiographic contrast, and easier readability with established exposure times.

And in addition to ranging up to more than double the speed, this new film retains the fine sensitivity characteristics which have made Kodak Type A the most widely used x-ray film in industry.

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# EQUIPMENT BUILDERS MEET ... See Favorable Outlook

By WILLIAM G. GUDE
*Managing Editor*

A GENERALLY favorable business outlook in the foundry equipment industry is indicated for the first half of next year. This opinion was expressed at the 38th annual meeting of the Foundry Equipment Manufacturers Association, held at the Greenbrier, White Sulphur Springs, W. Va., Oct. 18-20.

The majority of companies look for orders during the first half of 1957 to equal or exceed those for the first eight months of 1956. An even larger proportion expect sales to be ahead of the 1955 rate.

In the society's annual election, present officers were named to another term. They are: President, David E. Davidson, vice president, Link-Belt Co., Chicago; vice president, Gordon E. Seavoy, vice president, Whiting Corp., Harvey, Ill.; executive secretary-treasurer, C. R. Heller, Washington. New directors elected for three years are: Leon F. Miller, vice president, Osborn Mfg. Co., Cleveland; Chester V. Nass, vice president, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, and W. O. Vedder, manager, Dust Control Dept., Pangborn Corp., Hagerstown, Md.

Individual meetings of the society's product groups were held on Oct. 18, with general sessions conducted the succeeding two days. The annual business meeting included, in addition to reports of officers, a discussion by representatives of other foundry trade associations of the activities they are promoting which will enhance progress of the industry.

E. J. AuBuchon, M. A. Bell Co., St. Louis, and president, Foundry Facings Manufacturers Association, spoke on that group's work. F. Kermit Donaldson, executive vice president, outlined the market research program of the Steel Founders' Society of America. Arthur G. Hall, Nordberg Mfg. Co., Milwaukee, discussed some of the functions of the National Foundry Association of which he is vice president. Technical and marketing activities of the Malleable Founders' Society were described by its executive vice president, Lowell D. Ryan, and Donald H. Workman, executive vice president, Gray Iron Founders' Society, touched on the major programs of that organization.

In discussing the association's statistical reports on business activity, Einar A. Borch, National Metal Abrasive Co., Cleveland, emphasized the importance for the industry to push sales of equipment for modernization purposes, rather than to depend too heavily on demand from foundry expansion. At the same time, he pointed out that foundries should not expect equipment builders to use castings in making their products solely as a reciprocity measure, but should sell the castings on their merits.

Progress of the Foundry Educational Foundation since its inception in 1947 was detailed in a talk by its vice president, Chester V. Nass, Beardsley & Piper Division. A total of 1600 engineering graduates have entered the foundry industry during the period, and today more than 6000 students are taking at least the basic foundry courses at the FEF schools.

Others who spoke in support of the foundation program were Charles A. Barnett, Foundry Equipment Co.; Thomas Kaveny Jr., Herman Pneumatic Machine Co.; Otto Pfaff, Wheelabrator Corp., and William B. Wallis, Lectromelt Furnace Co.

Aims and recent activities of the National Castings Council, of which the FEMA is a member, were described by the secretary, Frank G. Steinebach, editor, FOUNDRY.

High lights of the recent International Foundry Congress and Foundry Fair at Dusseldorf, Germany, were presented by Mr. Nass. While American foundry equipment is well liked abroad, he said, it faces strong competition from the fact that corresponding European units are priced only 55 to 60 per cent as high.

A talk on "What the Foundry Industry Expects of the Equipment Manufacturers" by W. Rex Jennings, foundry superintendent, the John Deere Waterloo Tractor Works, Waterloo, Iowa, featured the closing session.

Mr. Jennings offered a number of recommendations for improving the usefulness of equipment, but he also pointed out that foundries sometimes are at fault in attempting to do certain work with machines not intended to handle that particular job. On

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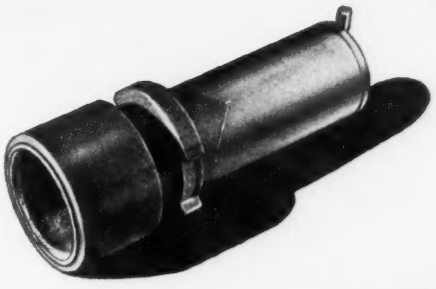
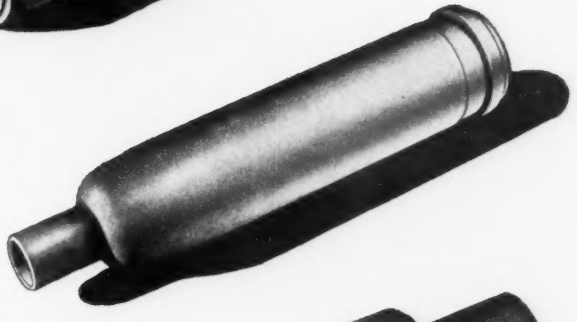




## THE PlastiSand® PROCESS

PlastiSand Resins are now available to you for processing sand in your own foundry, using standard mulling equipment. Many foundries show a 50% reduction in costs using this process.

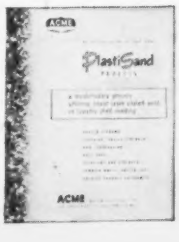
Virtually any sand may be used with assurance of completely desirable results, when combined with PlastiSand cold process resins. Sand processed with PlastiSand Resins is ideal for difficult patterns and for use in pneumatic systems.

### PLUS THESE FACTORS

1. **ECONOMY** . . . Foundries using the PlastiSand Process report superior molds with as little as one-half the resin content formerly necessary with dry resin.
2. **NON-SEGREGATING** . . . Each grain of sand is completely and uniformly coated with liquid phenolic resin in the PlastiSand Process — segregation cannot occur.
3. **DUST FREE** . . . Because liquid-resin is used there is no dust. An invaluable safety and health factor. The absence of dust means healthier working conditions, no irritating dust fumes, no danger of dust explosive.
4. **NON-CLUMPING** . . . Sand, treated with the PlastiSand Process is always free pouring — regardless of temperatures.
5. **GREATER PRODUCT UNIFORMITY** . . . Because it is non-segregating, resin-coated sand prepared by the PlastiSand Process yields almost identical molds, batch after batch.

The PlastiSand Process offers advantages for *all* shell molding foundries, *all* shell molding jobs. It is adaptable to dump-box, roll-over and blowing of either shells or cores.

***This informative booklet may be obtained by writing to Acme Resin***

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*Resin formulation and the coating process covered by Patents 2,706,163 and 2,706,188*

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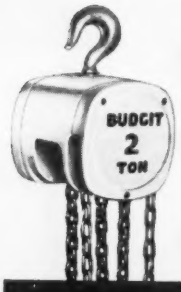


# SAVES WORK AND WORRY ON TOUGH LIFTING JOBS

Here's a sure way to ease up on heavy lifting. Let the 'Budgit' Aluminum Chain Block "take over" on production and maintenance jobs. This tough, lightweight hoist can lift a 500-lb. load with a hand chain pull of only 25 lbs. Worker energy is conserved — efficiency stays high. Equally important, the 'Budgit' has a fast-acting, automatic brake that helps reduce damage and spoilage when fragile loads are handled. It operates smoothly and easily — provides positive lowering control that makes accurate spotting a cinch.

Whether you require a hand hoist to set cores, to lift ladles or to save time in emergencies, choose the 'Budgit' Aluminum Chain Block. Every part is built for heavy duty. Every capacity — from ¼ to 10 tons — makes work easier and cuts load-handling costs. *Get details from your "Shaw-Box" Distributor or write us for Bulletins 405 and 415.*

AN I-BEAM TROLLEY adds travelability to any hoist. All types available. Capacities: ¼-ton up. Priced from $19.50. Ask for bulletin.

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some occasions, he said, this misapplication is the fault of the salesman. Among the speaker's major suggestions to equipment builders were these:

Build the sturdiest equipment you know how; don't oversell your equipment; be sure your salesman knows his equipment and has the facts in analyzing the customer's needs; reduce gadgets to a minimum and make them rugged; sell the man who has to supervise the equipment's operation, not the board of directors.

Looking to the future, Mr. Jennings called attention to the likelihood that casting demand would grow faster than the labor supply, thereby increasing the need for more productive equipment. In addition, he said, major changes in certain basic foundry practices are taking place, and this trend will continue. He referred particularly to the impact of the shell process on molding and coremaking, the growing use of electricity in the melting department, and the need for eliminating much of the hand labor in the cleaning room.

The 1957 annual meeting of FEMA, it was announced, will be held at the Greenbrier, Oct. 17-19.


buy and use
CHRISTMAS SEALS
fight tuberculosis

## Adds Vacuum Research Building

A new Vacuum Technology Building has been added to development facilities of Electro Metallurgical Co., division of Union Carbide & Carbon Corp., New York, at Niagara Falls, N. Y. The new building houses a variety of special experimental and pilot-scale furnaces, vacuum processing equipment, gas supplies, controls and auxiliary instrumentation. An open floor space of 7600 sq ft is provided. Other facilities also are in advanced stages of planning as part of a long-range program at Electromet.


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Big foundries . . . big users depend on National Bentonite to bond better molds, minimize sand problems and rejects.

They know they can rely on National Bentonite for uniform high quality . . . hot strength to resist erosion, washing and cutting... fewer blows, pin holes or rejects . . . less gas and steam to vent . . . castings that peel clean, shakeout with fine finish.

You can test National Bentonite's superior qualities. Write for sample.

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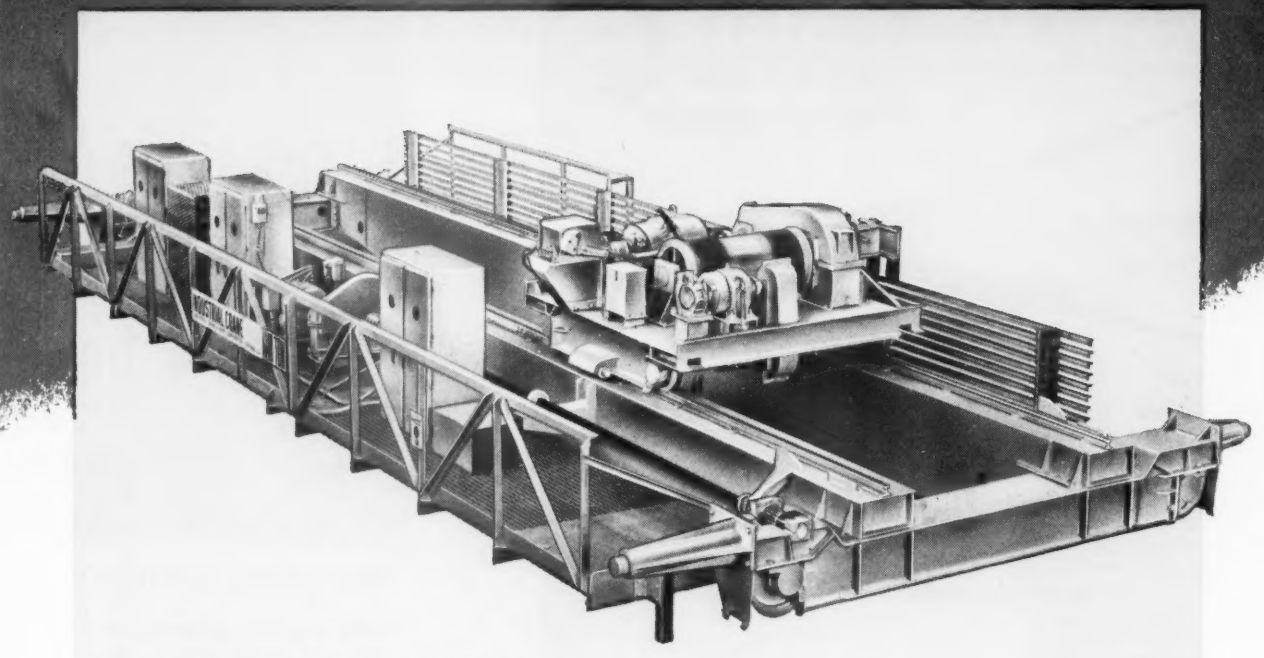

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Fig. 1 (above)—In area indicated, metal 2¾ in. thick, 6 in. wide and 16 in. long was removed from turbine. Fig. 2 (right)—Closeup of area

## Cutting and Gouging Torch

# SPEEDS METAL REMOVAL

REMOVAL of excess metal from reaction-type turbine castings made at Vancouver Iron Works Ltd., Vancouver, B. C., Canada, used to be an expensive, time-consuming job. With the use of the Arcair cutting and gouging torch, the time required has been reduced to a small fraction of what previously was needed.

The torch uses electrodes up to ½ in. in diam and operates from an ordinary direct-current welding machine and a compressed air line. Function of the air is to blow away metal as it is removed.

Figs. 1 through 4 illustrate cast steel parts for a Francis or reaction-type turbine, which in its entirety weighs about 90,000 lb and develops 96,000 hp at 240 rpm. The complete assembly is hydrostatically tested at a pressure of 950 psi.

Fig. 1 shows Alex Longo, welding superintendent, pointing to an area where metal has been removed from the rough casting. This area, a closeup of which appears in Fig. 2, is cast flush, and the material to be removed is 2¾ in. thick, 6 in. high and 16 in. long. Removal of this metal used to require about 14 hours. With the cutting and gouging torch, that time has been reduced to 1½ hours, and no clean-up is needed.

Fig. 3 pictures one of the torches in operation. The operator is gouging a circumferential seam on the same turbine job. In Fig. 4, Mr. Longo is indicating the size of these castings, which are about 5 in. thick.

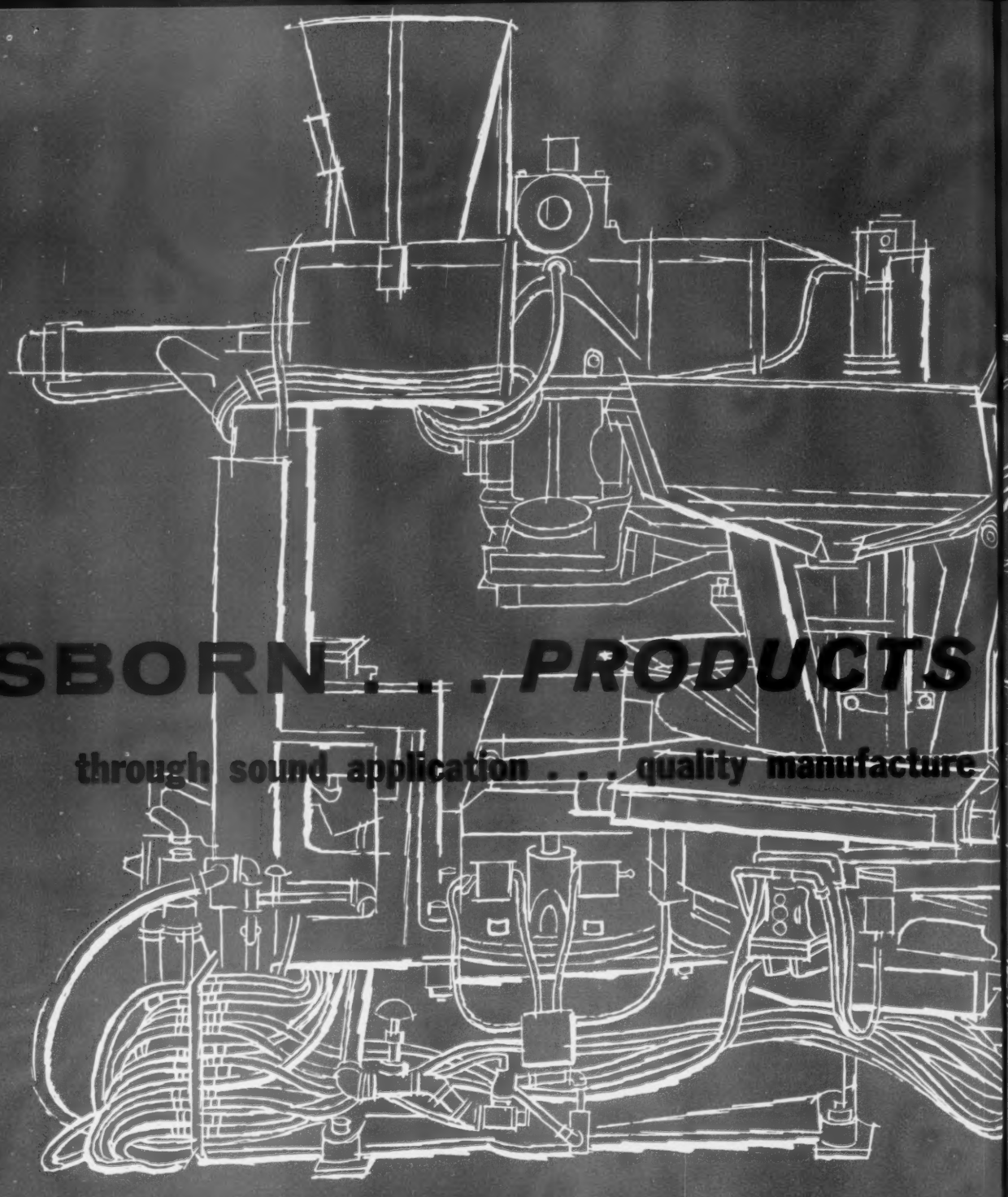
Preparation and welding are performed as follows. The butt seam is beveled from the inside to an included angle of 75 degrees by the oxyacetylene method, to approximately one-third the thickness of the material. All internal welds are completed first, and the outside preparation is tackled next.

The gouging torch is used to remove this metal to 100 per cent root penetration of the internal weld;

Fig. 4—Further view of part of turbine, in an area 5 in. thick

Fig. 3—Operator uses torch to gouge a circumferential seam

Fig. 5 (below)—Savings in preparation cost on 15/16-in. penstock Y were reported to be 65%



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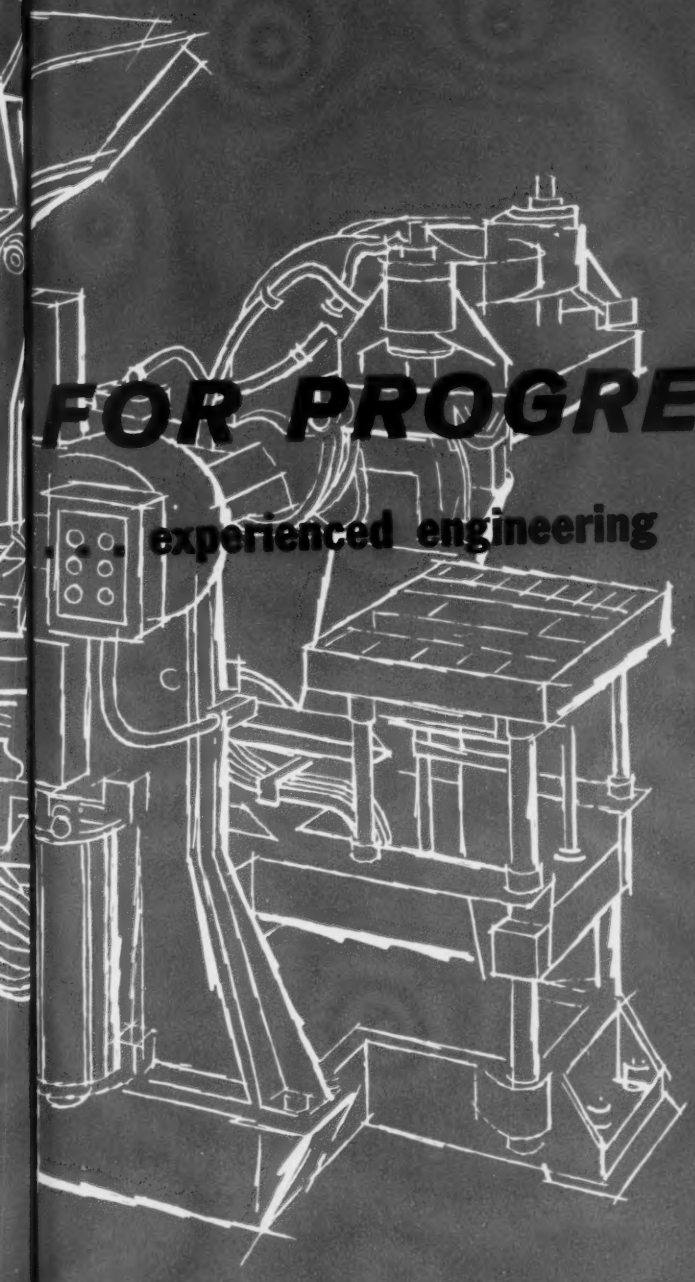

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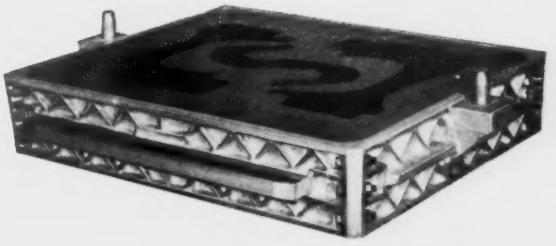
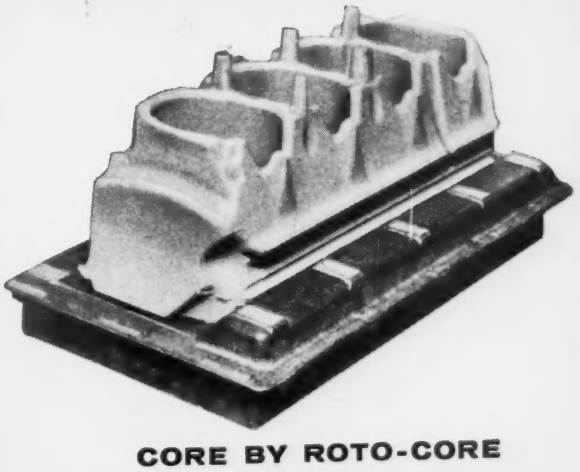


MOLD BY MOL-DEX



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whereas former methods of removal consumed 24 hours for each circular seam, the torch does the job in about four hours. The preparation is given a magnetic particle inspection before the external welds are started, and the same is done after each weld pass, to detect any cracking or foreign inclusions. Welding a seam requires about forty 5/16-in. carbons. The complete job, as shown in Fig. 1, consumes about 1800-2000 carbons. All joints are x-ray inspected after

Figs. 6 and 7—Use of a gouging torch is said to have cut cost of repairing these castings 50%

the job has been furnace annealed, and it is reported that no rewelding is necessary.

The torch operates with equal efficiency on rolled stock. Fig. 5 shows a penstock Y of 15/16-in. flange quality plate on which the company claims an approximate 65 per cent saving in preparation cost.

Figs. 6 and 7 illustrate casting repairs of types commonly encountered by the company. Use of the torch is said to have cut the previous costs of these repairs by about 50 per cent.


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**Spincraft**
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# OVERHEAD TRAMRAIL Cuts Mold-Making Costs

Lowering a heavy cope gently and easily onto a drag with a Cleveland Tramrail hand-propelled crane and power-driven hoist. This same crane delivers the heavy flasks to the pouring lines.

A tremendous amount of handling is required to make a mold. In fact, the cost of a mold is largely that for moving sand, pattern, and flask to the molding floor, handling of these items during mold-making, and conveying of completed mold to the pouring floor. Any improvements that you make in reducing the time required for handling these materials will cut your production costs.

Cleveland Tramrail equipment has proven highly successful in slashing handling time for mold-making in foundries of every type. It operates fast or slow as the work dictates. Raw materials can be handled speedily. Delicate molds can be hoisted slowly and gently and moved with nearly vibration-free travel over smooth overhead Tramrail tracks.

Hundreds of foundries throughout the United States and Canada are making large savings with Cleveland Tramrail in every department. Why not invite a Cleveland Tramrail engineer to discuss ways of cutting costs in your foundry.

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Six of the speakers at technical sessions of the conference are shown above. Left to right: Harry Kessler, Arthur A. Avedisian, Ray Cochran, Charles C. Reynolds, Roger B. Sinclair and Robert Sheldon

## *Attendance Record Is Broken at . . .*

# NEW ENGLAND CONFERENCE

By JACK C. MISKE
*Associate Editor*

CRISP, bright fall weather and an extensive program of technical papers attracted a record of more than 500 foundrymen to the 16th New England Regional Foundry Conference, held Oct. 19-20 at the beautiful new Kresge Auditorium of Massachusetts Institute of Technology.

Sponsors included New England and Connecticut chapters of AFS, MIT, Connecticut Non - Ferrous Foundrymen's Association, Connecticut Foundrymen's Association, Pine State Foundrymen's Association Inc., MIT Student Chapter of AFS, Boston Chapter of the Non-Ferrous Foundrymen's Association, Providence Non-Ferrous Foundrymen's Association and Northeastern University.

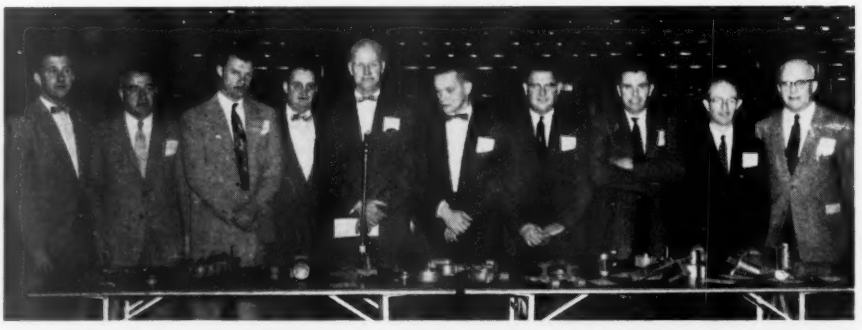
The meeting was opened by Conference Chairman Howard B. Nye, Marlborough Foundry Inc., Marlborough, Mass. Mr. Nye introduced Prof. Howard F. Taylor, MIT, who welcomed visitors for C. Richard Soderberg, dean of engineering, MIT, who could not be present. Frank W. Shipley, Caterpillar Tractor Co., Peoria, Ill., president of AFS, also was present and spoke briefly. Mr. Shipley paid tribute to MIT and other schools which co-operate with the foundry industry in presenting regional meetings. He predicted that the next 25 years will see even more change in foundries than the last 25 and closed his remarks with a description of the castings exhibit scheduled for the 1957 AFS convention in Cincinnati.

Papers included five sets of simultaneously presented ferrous and nonferrous sessions plus two joint sessions of a more general, less technical nature.

### FERROUS SESSIONS

**Cupola Operation** by Harry Kessler, Sorbo-Mat Process Engineers, St. Louis---There are many ways to burn in a cupola bed. It even is possible to get hot metal without burning in, although it is necessary to have a solid, hard, even bed eventually. Coke bed height should be measured to insure that it stays at a predetermined, optimum level. Weighing coke avoids trouble when coke density varies. Volume and air control must be adjusted with density.

As lining burns out, the bed drops, shortening the fall of metal and cutting carbon pickup. It consequently is important to stabilize bed height by maintenance of the diameter of the refractory lining. Improper charging can affect burnback, and coke size and type and other factors



One conference session consisted of a casting defects panel. Members of the panel were, from left to right, James Hamblin, L. J. Iadorola, Chairman Harry Sleicher, Cochairman John Morton, Moderator Alexander Beck, Ahti Erkkinen, Lewis Greenslade, Jack Healy, Don Sawtelle and James Stringfellow All conference photos are through the courtesy of Debevoise-Anderson Co.

# DEPENDABLE QUALITY...

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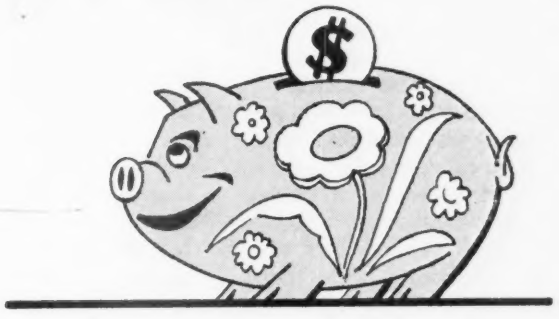


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Registration scene shows sloping concrete roof of Kresge Auditorium at MIT

also influence carbon pickup.

Air velocity is as important as volume, for it determines where metal is melted. Gentle blasts are not necessarily good. Proper blast velocity and good lining give uniform melting, with minimum burnback.

All charges should be weighed. Since coke size affects total carbon, many foundries screen out coke under 2 in. Cast iron borings can be charged, but usually not beyond 10 to 15 per cent of the charge unless high-carbon pig is used to balance the low carbon pickup of the borings.

**Improving Foundry Layout,** by Roger B. Sinclair, Meehanite Metal Corp., New Rochelle, N. Y.—Few foundries are fortunate enough to start with a well planned layout, and most grow without enough attention to the fundamentals of good layout. Today, the rising cost of labor has made most companies aware of the need of better layout to reduce labor requirements, speed productivity, keep material handling costs down, promote good housekeeping and keep operations flexible and economical with expansion.

All layout hinges on two principles: The flow of material and product through the section under study and the order of all items within the sections. Straight-line flow of production is ideal but rarely possible in a foundry. At its best, good foundry layout is a compromise between what is theoretically correct and what is practical and economical.

The first stage of layout planning is to review the plant as a whole and to establish the best possible relationship of production departments to each other. Set up a simple flow pattern within the limitations of the buildings and the budget. The second phase deals with the perfection of the individual departments which make up the foundry. The final stage is the study and improvement of individual operations or work stations within each department.

**Ductile Iron — Unvarnished,** by Arthur A. Avedisian, Taylor & Fenn Co., Windsor, Conn.—Manufacture of ductile, or nodular, iron presents many problems. These are formidable, but not insurmountable. Its advantages include minimization by the nodular graphite of the internal notch effect inherent in cast irons. It also permits the use of silicon in iron, for example, as a true alloying agent, and it has the castability of gray iron and strength of steel.

Cost of production is higher than that of other cast irons because of such expenses as royalties, cost of the nodularizing agent, more stringent testing and inspection, the need for basic-lined cupolas, the better control required, etc. The scrap rate is high, also.

Production hazards include danger of dross and inclusions, difficulty of risering and tendencies to pinholing and to swelling in large sections.

**Castings Defects—Analysis Panel.** Panel members included Alexander Beck, Whitman Foundry Inc., Whitman, Mass., moderator; James Hamblin, Saco-Lowell Shops, Biddeford, Me.; Lou Greenslade, Brown & Sharpe Mfg. Co., Providence, R. I.; Bob Walker, Whitin Machine Works, Whitinville, Mass.; Don Sawtelle, Malleable Iron Fittings Co., Branford, Conn.; Ahti Erkkinen, Fremont Casting Co., Worcester, Mass.; James Stringfellow, Draper Corp., Hopedale, Mass.; Lou Iadorola, Pioneer Foundry & Mfg. Co., Gilbertville, Mass.; and Jack Healy, Producto Machine Co., Bridgeport, Conn. The panel discussed various types of castings defects and methods of avoiding them, and answered questions from the audience.

**Cast Iron Metallurgy Can Be Understood,** by Charles C. Reynolds, assistant professor, MIT—Prof. Reynolds' paper consisted of a discussion of the fundamentals of ferrous met-

Left to right in the sunshine: John H. Orrok, Debevoise-Anderson Co.; Joseph B. Stazinski, General Electric Co., and Frank Shipley, Caterpillar Tractor Co., AFS president

Left to right, at the banquet: Bill Summers; Prof. Howard Taylor; A. M. Nutter, president, New England Chapter; Frank Shipley, and Oscar Kraft, Westover Corp.

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These vibrating pan type conveyors give constant top efficiency in handling foundry sand and other difficult bulk materials. Through adding a second deck of perforated plate, they provide double service in shaking out and conveying small castings—discharging sand and castings at different stations. Equipped with replaceable liners of stainless steel, mild steel or aluminum, the 32 Series Conveyor readily conveys hot, abrasive, sticky or other difficult to handle materials. Readily adaptable for returning shot to shot blast cabinets. With baffles and staggered discharge openings, it discharges sand evenly over a silo. Available with four different assemblies, depending on volume and weight of materials to be handled. There is a Simplicity Conveyor in the exact size for your materials handling system—to give you uninterrupted operation and lower maintenance—a steady product flow—when you want it—where you want it.

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allurgy, presented in simplified form easily understandable to laymen working with cast irons. He explained the various structures of iron, how they occur and what properties they possess.

## NONFERROUS SESSIONS

**Mold Behavior,** by R. J. Maddison, Whitehead Brothers Co., New York —When metal of relatively high temperature is poured into a sand mold, steam is formed at the mold-metal interface. This steam formation enlarges the volume of water present by 1500 to 1600. This steam condenses in the sand as soon as it loses its heat by contact with cooler sand grains and clay. Within 10 minutes after pouring, the water wall is about ⅛ to ¼ in. back from the mold-metal interface.

Experiments on mold permeability have indicated some interesting points. Gas movement in a mold does not occur in a great rush. It is a localized action. Flow friction through connecting, finely divided interstices is very effective. Overwet bond has reduced or little strength and even can be a lubricant. Its presence therefore constitutes the slip plane.

**Gating and Risering,** by Ray Cochran, R. Lavin & Sons Inc., Chicago —Gating and risering practices differ with ferrous and nonferrous metals and with various nonferrous alloys. Flow of metal should provide for not harming the mold, insuring progressive solidification and guaranteeing presence of feed metal. Pouring temperature ranges are limited. Placement of risers is of vital importance.

Long and short solidification range alloys call for different gating. In general, the red brasses have long solidification ranges and the aluminum bronzes short ranges. Directional solidification is more easily achieved in the short solidification range alloys. Good practice requires a fine balance of flow control, directional solidification, riser placement, pouring and temperature.

Chokes (strainers) can help in flow control, but too sharp a choke can create a venturi action which draws sand or inclusions into the mold cavity. Properly used, chokes help attainment of directional solidification, like the type which normally takes place in a wedge, and they can help to prevent mold erosion.

Size and shape of risers are factors to consider in addition to their location, which is dictated by the solidification pattern. Size varies with location of the riser, size of section and the alloy poured. The riser must get the last hot metal or it must be insulated to keep metal hot. Preferably the riser should be slightly higher than the mold cavity.

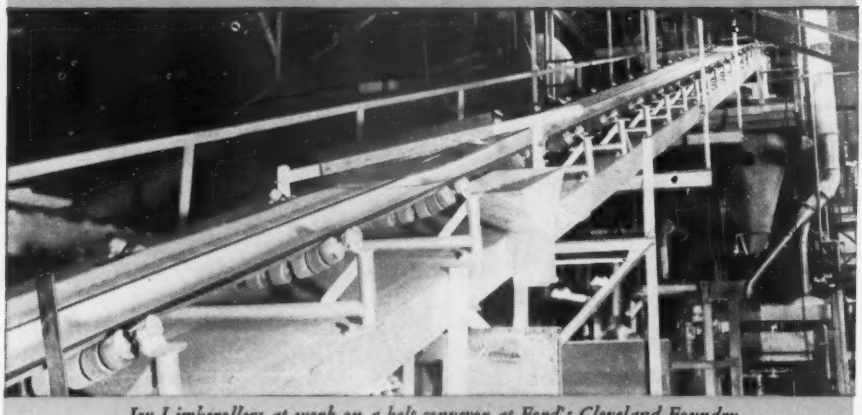
Since a minimum riser surface means minimum heat loss, a circular riser is best if vortexing is not a problem.

Best gating practice is achievable only after thorough analysis of casting design and the problems it presents.

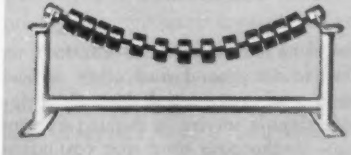
**Quality Control in a Small Foundry,** by Clarence A. Lyons, Gorham Mfg. Co., Providence — Quality control and inspection often are interpreted to mean the same thing, but they are not. Inspection is merely a sorting operation in which bad products are weeded out from good ones. It is designed to *find* bad castings, but not to *prevent* them. Quality control is a means of controlling the processes of manufacture to keep the level of quality within bounds. It should reduce losses, improve quality, help delivery and increase sales possibilities.

Quality control begins in the minds


**FORD Foundry uses JOY LIMBEROLLER Belt Conveyor Idlers**



*Joy Limberollers at work on a belt conveyor at Ford's Cleveland Foundry.*



This radical, new idler is used in handling abrasive foundry sands at Ford's Cleveland Foundry. Each idler is a single roller consisting of a series of pressure-molded neoprene or rubber discs on a flexible steel cable. Only two bearings are used and these are up out of the dirt zone.

Joy's new belt conveyor idler has already given over *twelve times* the service life of conventional idlers in handling many difficult materials . . . abrasive foundry sands, coal, petroleum coke, potash, copper ores, mill tailings, iron ore, wet concrete, triple super-phosphate, ammonium sulphate and sticky fertilizers.

The Limberoller is unaffected by most corrosives that damage steel . . . is ideal for chemical, sulphur and salt plants.

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of the people involved. A quality control program has three specific phases:

1. *Process Capability* — knowing what your process, equipment, supervision and men are capable of doing and not taking jobs beyond their ability to handle.

2. *In-Process Control* — the basic key of quality control, this phrase means knowing what you are supposed to do, how you are going to do it and what you actually are doing. Instruction and supervision must be based on knowledge of these facts. The three elements which require control are materials, equipment and method. Materials probably is the most difficult of the three to control.

3. *Data Analysis* — perhaps the most important phase of quality control, data analysis, or analysis of defects, permits you to appraise the results of changes. During the correction of faults, experimenting with gating, risering, pouring temperatures, etc., a careful log must be kept of results, and changes should be made only one at a time.

**What the Small Foundry Should Know about Heat Treating,** by Robert I. Sheldon, Springfield Bronze & Aluminum Co., Springfield, Mass.— Discussion is limited to the large number of aluminum-base and magnesium-base alloys which should be heat treated. Basically, there are three types of heat treatments.

*T2, or Annealing, Treatment* — Castings are heat treated at 650°F for a few hours to relieve internal stresses which may have been set up during the casting process. With the stresses removed, no permanent dimensional changes occur if the castings subsequently are used at elevated temperatures.

*T4, or Solution, Heat Treatment*— This so-called "soaking" treatment is used to produce substantially better mechanical properties than those which exist in the as-cast condition. It effects substantial improvements in mechanical properties and usually is used in conjunction with quenching in water at or near the boiling point.

*Other Heat Treatments* — Certain alloys, such as 355, 356 and, especially, 195, are affected by room-temperature aging. The third basic type of heat treatment is a variety of artificial aging or precipitation treatments. It includes those designated T5, T6, T7, T55, T71, T77, etc., and consists of holding castings at a moderate temperature to produce a controlled precipitation of the

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**... with ladle linings made of**

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J-M 3X Blazecrete makes possible cleaner castings because it has great ability to resist penetration and attack by molten metal.

3X Blazecrete . . . the 3000F refractory . . . is easily and quickly applied . . . mix with water like ordinary concrete, and slap-trowel to desired thickness. Hardens without application of heat. Contains no harmful irritants . . . safe even for hand application. 3X Blazecrete is furnished as a dry mix, and may be stored indefinitely without deterioration.

Longer lasting linings can be built with 3X Blazecrete because it is spall-resistant, withstands slagging action and has negligible shrinkage.

**Send for free brochure** on Blazecrete (RC-28A) describing its properties and uses. To obtain your copy—as well as additional application details—write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

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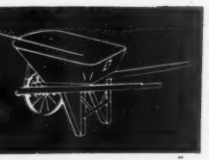

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★ ★ ★ This is where PATTERNS of quality and precision are produced for the automotive, aircraft and metalworking fields . . . backed by 35 years of know-how.

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AUTOMOTIVE PATTERN Company

*Wood and Metal Patterns*

18840 John R. St., Detroit, Michigan

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alloying constituents, thereby accelerating the natural aging process.

**$CO_2$ Process,** by A. B. Steck, General Electric Co., Everett, Mass.—Chief difficulty with the process seems to be the shakeout problem. Sodium oxide ($Na_2O$), released as part of the chemical reaction when treated sand is gassed with $CO_2$, surrounds the sand grains and lowers the melting point of the sand. Grains fuse and form a hard mass which gives poor shakeout.

Addition of 1 per cent fire clay to sand mixed with 3 per cent binder has yielded good shakeout characteristics with thin sections and even with brasses and bronzes. For higher temperature work, 2 per cent fire clay does the job. Alundum (2 per cent) also works with very high temperatures, up to 2900°F, but is costly. Experiments with bauxite (aluminum ore) will be conducted to see how it works since its cost is low. Natural-bonded clay should not be used. Mulling time varies, but should be kept down—to as low as 70 seconds—or sand will heat and start to set up. During the discussion it was suggested that blowing air through a core or mold after gassing helps drawing. Silicone sprays used once a day function very well as release agents.

## JOINT SESSIONS

**Of Money and Men**—Dr. Neil Carothers, economic consultant—The American economic system is the best one known. It works best when left alone. Such measures as tariffs, minimum wages, etc., are interference with the system.

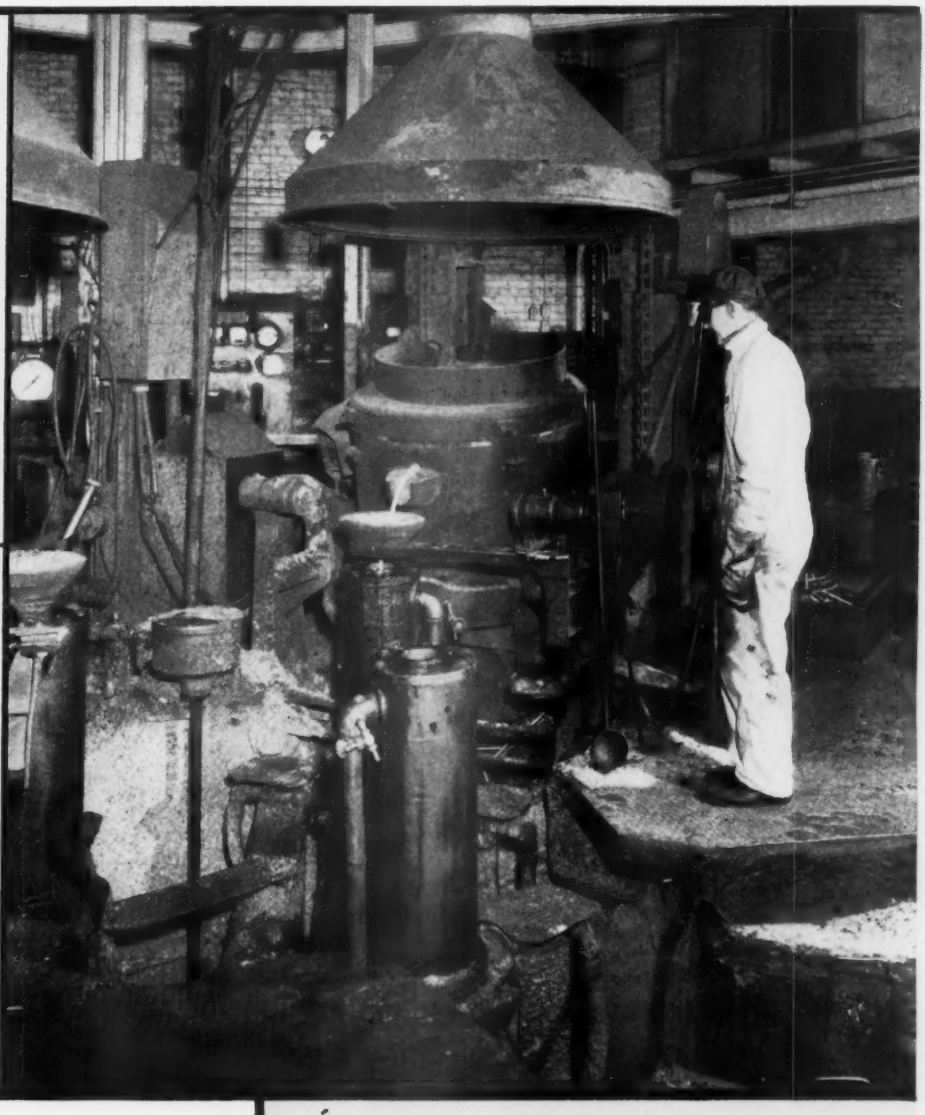
**The Foundry Can Be a Good Place To Work,** by Oscar H. Kraft, Westover Corp., Milwaukee, Wis.—Basic mechanical problems in the foundry involve material handling and reduction of manual labor. Even in small shops, such mechanization can cut costs, facilitate work, and help to produce a better product.

On Friday evening, Oct. 19, the conference banquet was held in the MIT Graduate House. Speaker was Bill Summers, American League umpire, who entertained the audience with a variety of anecdotes and also answered questions. Mr. Summers appeared through the courtesy of Mystic Iron Works and the New England Coke Co.

The conference closed on Saturday night with the traditional dinner and entertainment at the Parker House Roof. Refreshments and entertainment were provided by the local representatives of the foundry supply companies.

# Again . . . Norton refractories make good on a tough job

*Wolverine Tube Casting Shop selects engineered and prescribed ALUNDUM cement linings for around-the-clock melting service*



**One of the Ajax-Wyatt Furnaces** at Wolverine Tube, Division of Calumet and Hecla, Inc., Detroit, Mich. Furnaces are low frequency induction type, 2,000 lbs. capacity, melting straight copper as the first stage in manufacturing copper condenser refrigeration and other tubular products. Pouring is at 2150°F into the three 300-lb. billet molds on the rotating table in foreground. After a mold is filled and the billet set, the mold drops forward and releases the billet to rollers at bottom right. Operation is around the clock, six days per week, averaging five 900-lb. pours each eight-hour shift. Norton ALUNDUM refractory cement linings on this almost continuous service are giving excellent results.

Norton refractory cements are *engineered and prescribed* for longer, lower cost service across the entire range of furnace applications.

Whatever your own metal-melting problems may be, take advantage of Norton technicians' expert aid. Working with ALUNDUM*, CRYSTOLON*, MAGNORITE and FUSED STABILIZED ZIRCONIA refractory materials they will help you find the exact ℞'s you need for more melts per lining and per furnace-hour. For details see your Norton Refractories Engineer. Or write to NORTON COMPANY, Refractories Division, 311 New Bond St., Worcester 6, Mass. *In Canada:* A. P. Green Fire Brick Co., Ltd., Toronto, Ont.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries.

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**REFRACTORIES**
*Engineered . . . ℞ . . . Prescribed*
*Making better products . . . to make your products better*

NORTON PRODUCTS: Abrasives • Grinding Wheels
Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives
Sharpening Stones • Behr-cat Tapes

# Picture of a man about to cut GRINDING COSTS

He is checking up on the performance of grinding wheels in this foundry.

Is the rate of production high enough?

Are the wheels removing enough metal for the amount of wheel used?

Will the wheels stay sharp with a minimum of dressing?

Does the strength of the wheel provide a large safety factor under existing grinding conditions?

It is this man's job to find the answers to these questions, and to solve any grinding wheel problems.

Wherever he goes, this United States Rubber Company grinding wheel field engineer commands respect because superintendents have learned to profit from his unmatched, practical on-the-job experience in solving these problems. For he has behind him years of field experience in wheel manufacturing and development. And the company he works for, "U.S.", has more than 91 years' experience in grinding wheels.

So, when you have a grinding wheel problem, arrange for his expert help—either through the "U.S." salesman who regularly calls on you, or by contacting Grinding Wheel Sales Dept., U.S. Rubber, 4300 New Haven Ave., Ft. Wayne 4, Ind.

*Watch NCAA football, Saturday afternoon, NBC-TV*

US RUBBER

Mechanical Goods Division

**United States Rubber**

# Man to Man

RALPH L. LEE

*"It seems to me that no foundry, however small, need feel left out in the dark in this dazzlingly brilliant age of automation"*

## Slightly Automated Lee Hobby Foundry

FOR some time now I've been wondering why the butterflies I keep alongside my pending ulcers begin to flutter every time I hear or read the word *automation*. Then, too, as president of the Lee Hobby Foundry I catch myself apologizing to foundry groups for our lack of automation and seem to drift toward the outer fringes of the more elite foundry circles.

After I had read "Automation—Bogeyman or Bonanza?" in the Oct. 15 issue of our sister magazine *Steel*, it suddenly dawned on me that none of my many friends in the noble professions of process, tool or special machine engineering ever use the word automation—at least when I'm with them.

Most of them, I'm quite sure, would have one heck of a time trying to tell you just when this so-called era of automation burst into full bloom or just where the dividing line is which separates the automated from the nonautomated.

Wrestling with these questions while seated at my drafting table in the engineering department (#332B) of the Lee Hobby Foundry, I was interrupted by the air compressor's popping into action, all by itself. Ordinarily I don't even hear the darned thing stop or start. After it had made up its mind to stop, I heard the growling of the gears in our automatic electric clock, which never needs winding or setting, but keeps split-second time— astronomical in fact—all by itself.

There's a little float valve in the carburetor, I guess you'd call it, of our oil-heating stove which automatically keeps the fuel level just so, regardless of how much oil is in the tanks outside or of how low or high the stove is turned up. It does this all by itself.

When I throw the switch on any one of the 9 motors or 14 electric lights here in Plant No. 1, I don't have to call up the boys in the boiler room at the power plant to throw in a couple of extra shovels of coal—for the whole system is automated.

The Lee diaphragm molding machine is equipped with an automatic-pressure, pop-off and on valve which squeezes the mold exactly right (we built it ourselves). The heat control of our core oven is automated—and so is the sand moisture tester heater.

After this inventory of our automation, I began to hold my head a bit higher and to sympathize with my engineer friends for their inability to set the date of this fantastic new era of automation.

As a very young kid, behind the back of the screwmaker, I used to watch an automatic screw machine play tunes on bar stock all by itself, once it was set up. Many years before the word automation even was thought of, automatic boring and drilling machines did everything but talk. So did tin can making machines, safety pin twisters, packaging marvels and printing presses.

Nosiree, self-acting, self-regulating mechanical devices and systems did not pop into being with the coining of a word, but started 'way back yonder with the first guy who rigged up an automatic stop on a lathe carriage or some such trick, and at an ever-increasing pace, without spectacular jumps, they have progressed to this present day.

Automation comes to the foundry

Excuse me for changing the subject, but we finally ran water up from the house to Plant No. 1—about 150 ft. Kept putting this off for a long time on account of the expense of an automatic ditchdigger. The minimum charge for this time and labor-saving wonder was $75 for the ditch alone. But a fellow with an old-fashioned shovel, together with his plumber pals, did the job for $84, all hooked up, ready to squirt, and with no discount, either.

With electronic tubes, transistors, solenoid valves, hydraulic cylinders and some form of automatic player piano rolls, you can do just about anything you can think of—that is, if your production can afford the cost of designing it, building it and keeping it up. Goldberg, of course, went much too far.

With just a glimpse at the man-hours it takes to conceive, design and build an elaborate example of automation, it doesn't take a genius to figure out that it takes one whale of a lot of standardized production, free from too many changes and assured for a long enough time ahead, to make automation pay for itself, let alone show a profit over the system it replaces.

But even when and where all-out automation seems to be justified, there's nothing uncanny, marvelous, miraculous or stupendous about even the most elaborate example. It's just a lot of fairly simple elements geared together and operating in time on well known, basic principles. Most

of these elements were developed and perfected individually; each now is able to play solo, in a duet, a quartet or as members of a full concert orchestra.

This being the case it seems to me that no foundry, even the smallest, need feel left out in the dark in this dazzlingly brilliant age of automation. It's not a question of whole hog or none, but in any degree to fit the needs at hand.

One horsepower-hour produced by human muscles cost around $12. Produced electrically, it costs around 4¢. Distance which is covered on foot costs plenty a mile. Last week, I chartered a plane and pilot for 25c a mile.

In spite of my ditchdigger exception, it seems to me that it certainly would pay to scan even the smallest foundry operation for opportunities to substitute cheap power for exorbitantly expensive walking, lifting, toting, ramming and shoveling by muscle flexing.

A foundry doesn't need to cover acres before even the most spasmodic, small-lot production planning and scheduling can pay off handsomely in muscle, step and time savings. In the one-man Lee Hobby Foundry the budget is all set (and approved by Mother, Mrs. Lee, who also is treasurer), and plans have been laid for a short stretch of conveyor. The old boy is weakening up a bit in the back, with his steps per minute slowing down.

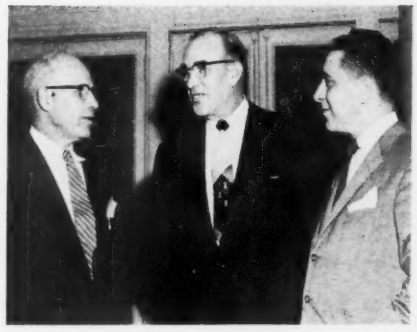
I'm also sketching up a little sand system, appropriate for a one-man operation, which will be slightly automatic—just a little bit that is. We're also leaning quite heavily on the slick developments in the pattern-making field to make up for the lack of master molding experience and skills.

Although having a handy place for everything and everything in its place is a far cry from automation, the dollars saved by avoiding fanning air and looking for misplaced things are just as spendable as any others.

It just occurred to me that any of our foundries, from the smallest to the largest, can automate as much or as little as is good for the old pocketbook by leafing through the pages of FOUNDRY. Doing it myself, I find that practically all the basic units and services required to do the job are being advertised.

## New York Pushes Program For Accident Prevention

More than a thousand community leaders, industry, labor, insurance and professional safety executives gathered with government officials

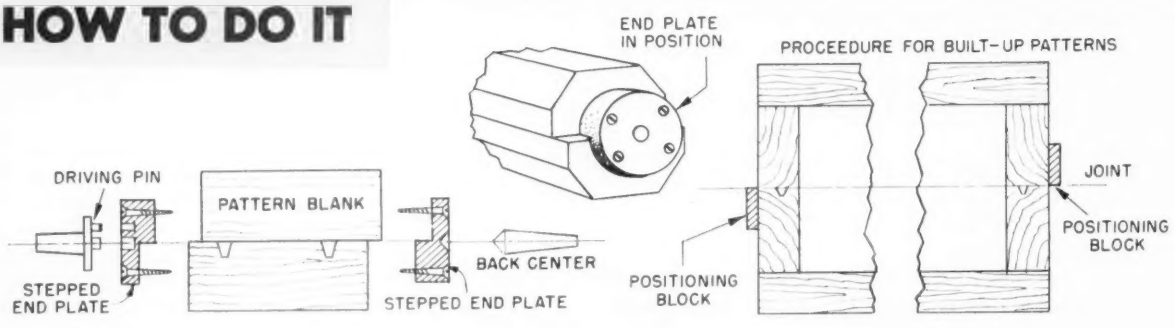


in Albany, N. Y., recently for Governor Harriman's Conference on Worker Safety. They heard the governor urge co-operation with the state's new program to cut New York's annual $750 million on-the-job accident toll.

Among those attending the two-day sessions were (left to right) Milton D. Emery, Buffalo Pipe & Foundry Corp., Tonowanda, chairman, Western New York Chapter, American Foundrymen's Society; William C. Stevenson, chairman, Eastern New York Chapter, AFS, and superintendent of the Cohoes plant of Ludlow Valve Co., Troy; and Nicholas A. Caimano, assistant industrial commissioner of the New York State Labor Department, Albany.

Some 66 experts from many fields participated in the program.

# HOW TO DO IT




## Stock Centering Device Facilitates Lathe Work on Split Patterns

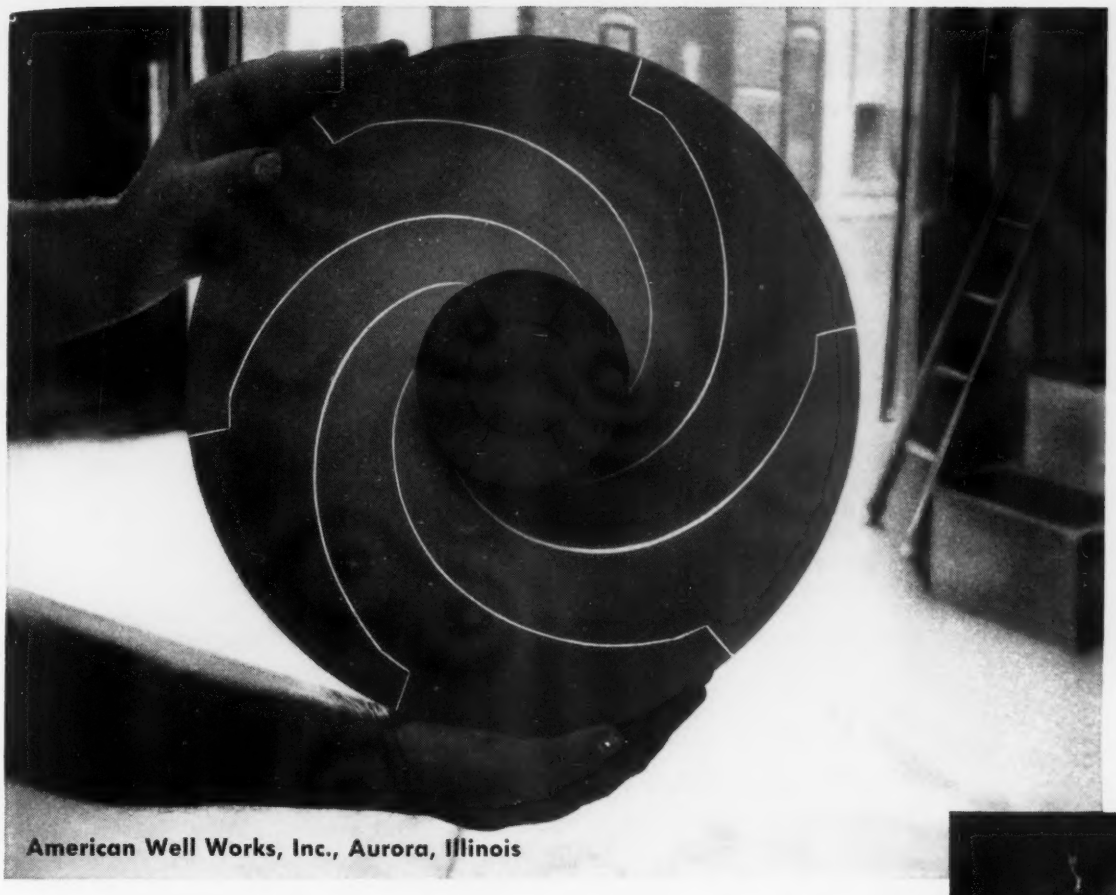
By A. H. SQUIRE
Sutton Coldfield
Warwickshire, England

SIMPLE device permits removal of rough stock for a pattern being made in halves from a lathe for intermediate work by hand or machine, and accurate replacement of the halves for final turning.

Two, stepped wooden end plates are made as shown in sketch. One is for the center and driving pins; the other is for the back center. The step in the plates is made along the center line. Locating pins and holes in the two pieces of stock for small and medium patterns are placed so that the ends of the pattern halves are stepped. Positioning blocks may be fastened to the ends of large, built-up patterns to achieve the stepped effect. The extensions to the joint face engage the step in the end plates and assure a true center joint. Screws are used to fasten end plates to the pattern halves.

It is easy to remove the job from the lathe, separate the halves and replace, accurately, by this method.

**Do you have any tricks of the trade tucked away with your foundry experience, Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea**



American Well Works, Inc., Aurora, Illinois

# "IF IT'S NOT PERFECT, IT MUST BE THROWN OUT!"

## Why American Well Works uses Cities Service Delco Core Oil

Mister, you're looking at one of the most complicated cores made—and at American Well Works, it must be perfect or get thrown out.

American has an 86-year reputation to maintain—a reputation for custom-engineered deep well turbine pumps and other equipment for handling water and waste.

For this reason, American carries the making of parts from raw material to finished product. Naturally, that means its own foundries . . . one for iron, another for brass. In each case, however, the brand of core oil is always the same—Cities Service Delco Core Oil.

At the iron foundry, Delco #936 has won high praise for its adaptability to all sized cores, without alteration of the mixture. "It's uniform from batch to batch, has reduced blows to a minimum, and allows us to use one quart of oil for every three required by our previous brand," reports American.

The story is similar in the brass works where Delco #54 is used to make intricate cores for pump castings. "Core and core oil must be perfect," says American, "and we're happy to say they almost always are."

To find out more about Delco Core Oils and results of firms such as American, talk with a Cities Service Representative. Or write: Cities Service Oil Company, 20 North Wacker Drive, Chicago 6, Illinois.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

**Pouring A Casting,** American's employees put the core and its core oil to the acid test. Thanks to Cities Service Delco Core Oils, blows have been reduced to a minimum in both the brass and iron foundries.

**Many Sized Cores** are produced by American Well Works' iron foundry—yet one oil, Cities Service Delco #936, is suited to them all, without alteration of mixture. They now use only 1 qt. of Delco #936 for every 3 required by their previous oil.

# Foundry Developments

By EDWIN BREMER
*Metallurgical Editor*

ONE of the largest slag pots ever made is shown in the accompanying illustration. It represents several advancements in the foundrymen's art, according to Edward F. Koglin, metallurgist, Union Steel Castings Division, Blaw-Knox Co., Pittsburgh, which cast it. The pot has a capacity of 480 cu ft and weighs 47,000 lb. Additional features are the flat bottom, cast integrally, as well as the three trunnions on

each side. Usual practice is to bolt the bottom plates to the cast steel body, with the trunnions part of a separate pot-holding cradle.

## Surface Tension

DETERMINING the surface tension of cast iron by measuring the nodes and antinodes of an oscillating stream of molten metal passing through a small elliptical opening, Pohl and Scheil studied the effect of changes in composition on surface tension. Described in a paper presented at the recent Duesseldorf Foundry Congress, results indicate that sulphur additions decrease surface tension—as does phosphorus—but the latter is only about one-sixth as effective as sulphur. Silicon additions result in only a small reduction in surface tension. By pouring spiral fluidity tests it appears that high surface tension produces short spirals, and low surface tension results in longer spiral pieces.

## Spectrographic Standards

SIX new spectrographic standard samples of zinc-base alloys now are available from the National Bureau of Standards. Carefully analyzed and certified as to composition, the new standards are designed for calibrating and checking spectrochemical methods in analysis of two important zinc-base die-casting alloys; ASTM designations AG40A and AC41A. For each of the two alloys, three standards have been issued to provide necessary composition ranges for the elements covered by the specifications—aluminum, copper, magnesium, iron, lead, cadmium and tin. They also contain useful concentration ranges for chromium, manganese, nickel and silicon. The standards may be obtained from the bureau for $8 each. Provisional certificate with each gives average values of analyses reported by co-operating laboratories.

## Hydrogen Causes Trouble

INVESTIGATION of "The Influence of Hydrogen in the Titanium-$CO_2$ Process" by Dawson, Bach, and Smith reported in the June, 1956 issue of *Journal of Research and Development* (Birmingham, England), indicates that when titanium is added to molten cast iron with low hydrogen content and balanced sulphur content, undercooled graphite structures will be obtained. Hydrogen content may be lowered by bubbling a dry inert gas such as $CO_2$ or argon through the melt or by vacuum melting. Undercooled graphite is not formed by addition of up to 0.3 per cent titanium when the hydrogen content is high. Unbalanced sulphur contents prevent the formation of undercooled graphite by titanium.

## Notch Ductility

SOME conclusions in a paper, "Notch Ductility of Malleable Irons," by Sandoz, Howells, Bishop and Pellini presented at the recent annual meeting of the American Society for Metals indicate that the NDT (nil ductility transition) temperature increases proportionately with P content. With very low P (below 0.03 per cent) the NDT temperatures are below minus 150°F. For high P (0.20 per cent) transition temperatures are in the order of 0°F. Presence of up to 0.20 per cent S in presence of sufficient Mn to effect a combination, has no effect on NDT temperature. S lowers the energy level of the upper shelf of the Charpy curve, however, which makes the iron less resistant to tearing (shear) type fractures.

Notch ductility of ferritic malleable is insensitive to section size if primary graphitization is prevented. Well made commercial irons have NDT temperatures in the order of minus 50°F in section sizes up to 3-in.-thick bars. Pearlitic malleable irons of reheat-treated, and air-quenched and tempered type having Brinell hardness values in the range 160 to 190, develop NDT at temperatures between 10 and 70°F.

Notch ductility of pearlitic malleables appears highly sensitive to type of heat treatment, as indicated by limited tests of alloy arrested-anneal irons. Stated values are characteristic of specimens from which the decarburized surface layers were removed. With such surface present, NDT temperatures are raised approximately 20°F. There is good correlation between NDT temperature of malleable irons and Charpy V-notch energy transition curves. NDT occurs at the temperature where the Charpy V-energy values are 3 to 6 ft-lb (lower toe of transition curve).

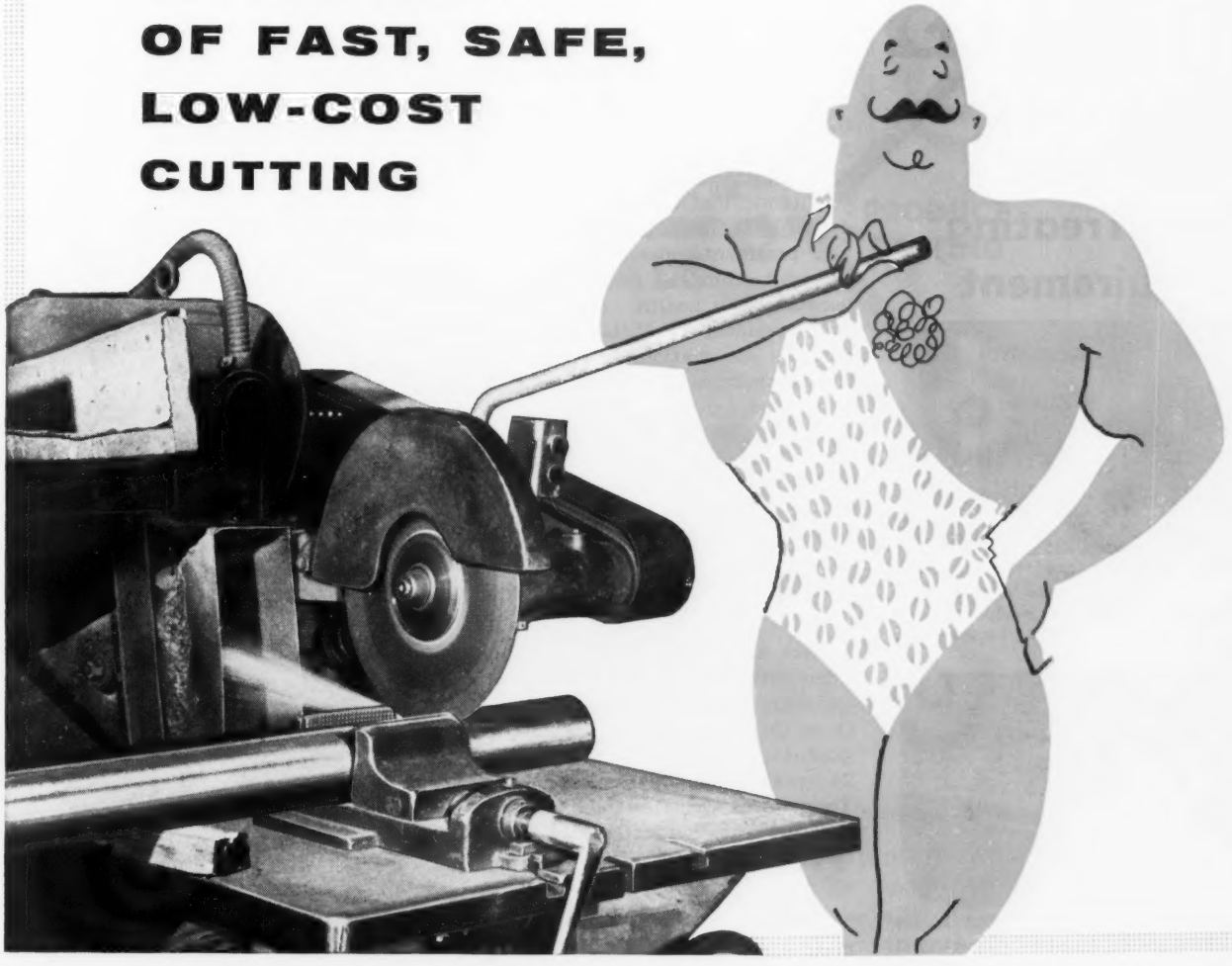
## Loosens Hold

REMOVAL of $CO_2$-treated cores and molds which tend to stick in coreboxes or to the patterns is facilitated by use of high-pressure compressed air, according to one foundryman. Method is to attach shop compressed air line to the tubes or pipes used for injecting the $CO_2$. With the tubes pushed down to the depth used in gassing, full air line pressure is applied. A silicone release agent commonly used in shell molding also is said to afford relief from sticking.

## Reduces the Time

DIRECT-READING spectrometer installed at Lukens Steel Co., Coatesville, Pa., has reduced time for running preliminary determinations on open-hearth alloy steels from 25 minutes to 5 minutes. Unit manufactured by Baird Associates-Atomic Instrument Co., Cambridge, Mass., is specially calibrated for 11 elements. Instrument also permits analysis of scrap with no delay in loading or unloading operations.

# 16 YEARS . . . OF FAST, SAFE, LOW-COST CUTTING



Type C10AF Tabor-Brasive Cut-Off Machine in daily use at American Manganese Bronze Co., Philadelphia, since 1940. Operator is cutting a 3¾"-dia. No. 1 high-tensile bronze casting.

American Manganese Bronze Co., Philadelphia, bought this Tabor-Brasive Cut-Off Machine in November, 1940, and they've been using it ever since. That's 16 years of fast, clean cuts . . . easy, safe, full-visibility operation . . . and pennies for maintenance.

"We cut all sizes from ¼" to 7" diameter, and any size up to 4½" without rolling," said the Cleaning Room Foreman, in charge of grinding and chipping for American Manganese Bronze Co. "Finish-grinding costs are low, and about the only maintenance our Tabor Machine needs is an occasional new belt."

You can get even greater advantages with the *newest* Tabor-Brasive Cut-Off Machines. On the 15 hp unit, there's a new hydraulic table lift, for low operator fatigue and fast cutting time. Extra table room on the redesigned 5 hp machine helps speed its full range of cutting service.

Tabor Machines provide dry or wet cutting, right angle or bevel, through practically any metal — even tough materials like nodular iron and titanium. Adjustable, precision bearings keep spindle free of end-play. Units range from 5 hp to 20 hp. Write today for literature, or ask to see the Tabor man — the technical man.

**THE TABOR MANUFACTURING CO.**
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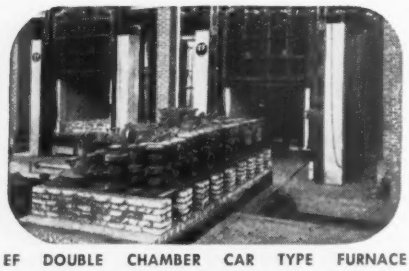
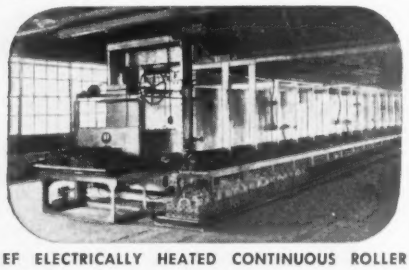
THE TABOR MAN **TM** IS A TECHNICAL MAN

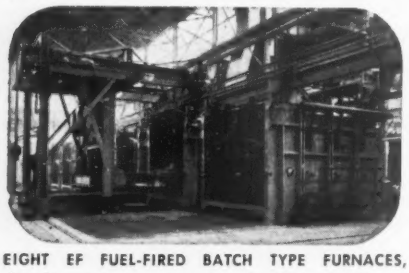
EF FURNACES
for EVERY Foundry Heat Treating Requirement



EF DOUBLE CHAMBER CAR TYPE FURNACE for annealing castings, equipped with three furnace cars and one transfer car incorporating car puller. Built by The Electric Furnace Co., Salem, Ohio.



EF ELECTRICALLY HEATED CONTINUOUS ROLLER HEARTH FURNACE for the scale-free annealing of various iron alloy castings in special atmosphere. Built by The Electric Furnace Co., Salem, Ohio.



EIGHT EF FUEL-FIRED BATCH TYPE FURNACES, showing gantry crane that handles the large, heavy castings into and out of the furnace and quenching equipment. Built by The Electric Furnace Co., Salem, Ohio.

**Foundry Bulletin No. 461**
shows typical installations of EF Gas-fired, Oil-fired and Electric Furnaces
*Send for a copy today!*

THE ELECTRIC FURNACE CO.
*Salem - Ohio*
GAS-FIRED, OIL-FIRED AND ELECTRIC FURNACES FOR ANY PROCESS, PRODUCT OR PRODUCTION

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# Obituary

**WILLIAM H. McFADDEN,** 87, for many years active in the foundry industry, and donor of the William H. McFadden Gold Medal of the American Foundrymen's Society, died recently in Fort Worth, Tex. In 1888 he joined Mackintosh, Hemphill & Co., Pittsburgh, where he was superintendent of the open-hearth steel department, assistant manager and vice president-general manager. He resigned from the company in 1910 because of ill health. Mr. McFadden was president of Pittsburgh Foundrymen's Association, and the American Foundrymen's Society in 1905 and 1906, vice president of Steel Founders' Society of America, 1909-1910, and vice president of the General Steel Casting Association, United States and Canada, 1903-1910. He was actively identified with the National Foundry Association for many years as chairman of the Third district.

**Paul A. Meyer,** 64, a founder, and since 1949 vice president-engineering, secretary, and a director of Michigan Oven Co., Detroit, died recently. A graduate of University of Kansas, for 25 years he was chief engineer, Young Bros. Co., Cleveland, and spent several years with General Electric Co., Schenectady, N. Y.

**Thomas Clark,** 54, since the beginning of the year assistant director of the Joint Iron Council, London, died Sept. 14. In 1945 he was appointed secretary of the council, the Council of Iron Producers, the Foundry Pig Iron Producers' Association and the Cast Iron Pipe Association.

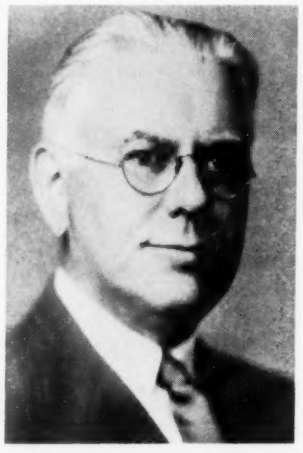
**George J. Golden,** president, Golden's Foundry & Machine Co., Columbus, Ga., died Oct. 18, after an association of over 40 years with the company. He was a former director of the Gray Iron Founders' Society.

**George J. Gedeon,** 66, for 35 years a patternmaker for Aluminum Co. of America, Cleveland, died Nov. 8. He retired a year ago as foreman of the pattern department.

**William W. Myers,** at one time president of the former Weller Hardware & Foundry Co., Horseheads, N. Y., died Nov. 5.

**Deming H. Lucas,** 71, foundry suppliers' representative, died Nov. 5 in Chicago. For 12 years Mr. Lucas was chairman of the membership committee of the Chicago Chapter of the AFS, relinquishing the post in December because of ill health.

**William B. Sullivan,** 80, former manager of alloy sales, Lebanon Steel Foundry, Lebanon, Pa., and one of the founders and a former president of National Alloy Casting Association, predecessor of the Alloy Casting Institute, died Nov. 3. Mr. Sullivan was a pioneer in development of high temperature alloy castings. He joined the executive staff of Lebanon



WILLIAM B. SULLIVAN

Steel Foundry in 1935, after connections with Carpenter Steel Co., Reading, Pa., and Rich Tool Co., Chicago. In 1928 he organized Michiana Products Corp., Michigan City, Ind., for manufacture of high-temperature alloy castings.

**Albert J. Sprong,** retired president of the former Haven Malleable Castings Co., Cincinnati, died Oct. 17 at his home in Niles, O.

**Joseph D. Walsh,** works manager, Scullin Steel Co., St. Louis, died Oct. 25. He joined the company 50 years ago.

## Acquires Refractories Plant

Laclede-Christy Division of H. K. Porter Co., St. Louis, has acquired the refractory plant and property of Robinson Clay Products Co. at Alexandria, Pa. Sales and operation will be combined with those of Laclede-Christy, and the new acquisition will be known as the Alexandria Works. Modern equipment will be installed in the near future.

# THEY ARE BOTH THE SAME

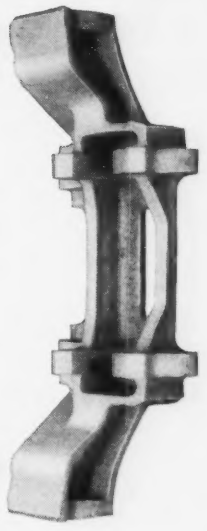
TEST BAR

in

CHEMISTRY &

PHYSICALS

PRODUCT CASTING



## When the Metal is

# FRONTIER

## 40-E* Aluminum Alloy

*Reg. T. M.

Whether you purchase Frontier 40-E Aluminum Alloy castings direct or from a foundry licensed to produce this alloy, you can be sure that the high qualities that have made this alloy famous are being maintained. How is this controlled? Test bars are required from all licensees. These are sent to the technical research laboratory of the Frontier Bronze Corp. for complete analysis and physical testing.

One of the most unusual features of Frontier 40-E Aluminum Alloy is the fact that the physical properties which spell high quality in the test bar appear uniformly throughout a large casting. And since Frontier 40-E is a non-heat-treated aluminum alloy the high strength physical properties are obtained by natural aging at room temperatures. The high yield strength of Frontier 40-E Aluminum Alloy is of special value in designing parts that must be light in weight and yet resist distortion or deformation.

*Yes, the test bar mirrors the quality of the product casting . . . here's proof.*

| FRONTIER 40-E | TEST BAR | CASTING |
|---|---|---|
| Yield Strength | 23,500 | 22,700 |
| Tensile Strength | 36,600 | 35,500 |
| Elongation | 7.5 | 7.5 |

Please send me a copy of the Alloy Data Book giving Engineering and Metallurgical Facts on the physical properties of Frontier "40-E".

NAME.....

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ADDRESS.....

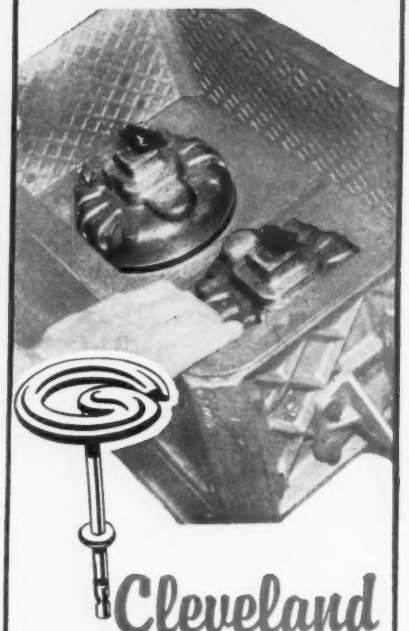
CITY..... STATE.....

## FRONTIER BRONZE CORPORATION

4878 PACKARD ROAD, NIAGARA FALLS, NEW YORK

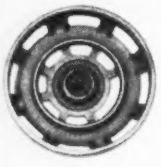
# TAYLOR & BOGGIS

USES 18% LESS SAND
SAVES LABOR WITH...



Cleveland
FLAT COIL
CHAPLETS

*Note clean chaplet breakoff on end bell hub which reduces cleaning operations.*



*Due to their low cost, Taylor & Boggis also uses flat coil chaplets for soldiers in deep green sand core pockets.*

Only 1/2" to 1" of sand cover is required in the cope for firm support of these end bell core chaplets. Flasks are lighter and 18% less sand is handled on the end bell mold line.

In addition to providing positive core support, Cleveland Flat Coil Chaplets speed molding at Taylor & Boggis due to uniform stems and plating thickness. Check today for details on flat coil chaplet advantages in your molding lines.

**Write today for sample and catalog!**

Cleveland Since 1890

**CHAPLET & MFG. CO.**

26471 LAKELAND CLEVELAND 32, OHIO

*Circle 670 on Inquiry Card—Page 217*

Five of these manhole ring frames are cast per hour in permanent molds. No machining is needed on the castings

## *200-Pound Manhole Ring Cast in*

# PERMANENT MOLD

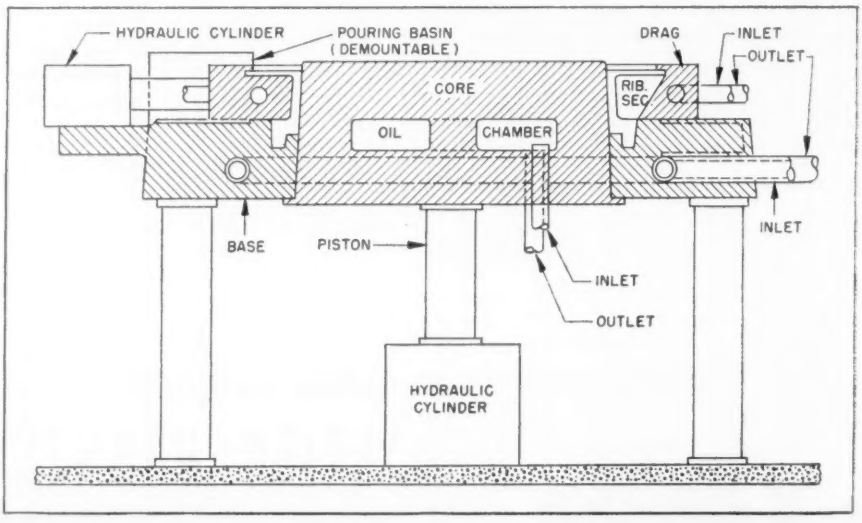
SANTA CLARA Casting Products, San Jose, Calif., is producing iron manhole ring frames in a permanent mold machine designed by Matthew Wagner of Wagner Permanent Mold Co., Burbank, Calif. The rings weigh about 200 lb and are produced at the rate of five an hour. They are poured upside down in the mold.

Four alloy iron mold sections form bottom and outside sections of the ring frame. The notched ring at top of the frame is formed by a stationary section constituting the base of the mold. An alloy iron core forms the center opening in the frame. Hydraulic cylinders open and close the four mold sections in a horizontal plane; the core also is raised and lowered hydraulically. In addition, cooling oil is circulated through the core and mold sections.

Preparatory to pouring a casting, the core and mold sections are heated to about 300°F and coated with a refractory material. Then the mold is closed and molten iron poured into a suitable pouring basin mounted along the periphery of the mold cavity. When the casting has solidified, the core is lowered and the four mold sections pulled back to permit sufficient clearance for a mechanical lifting device with finger grips to lift the casting from the base of the mold. The complete cycle takes 12 minutes. Life expectancy of the manhole frame mold is a minimum of 50,000 castings.

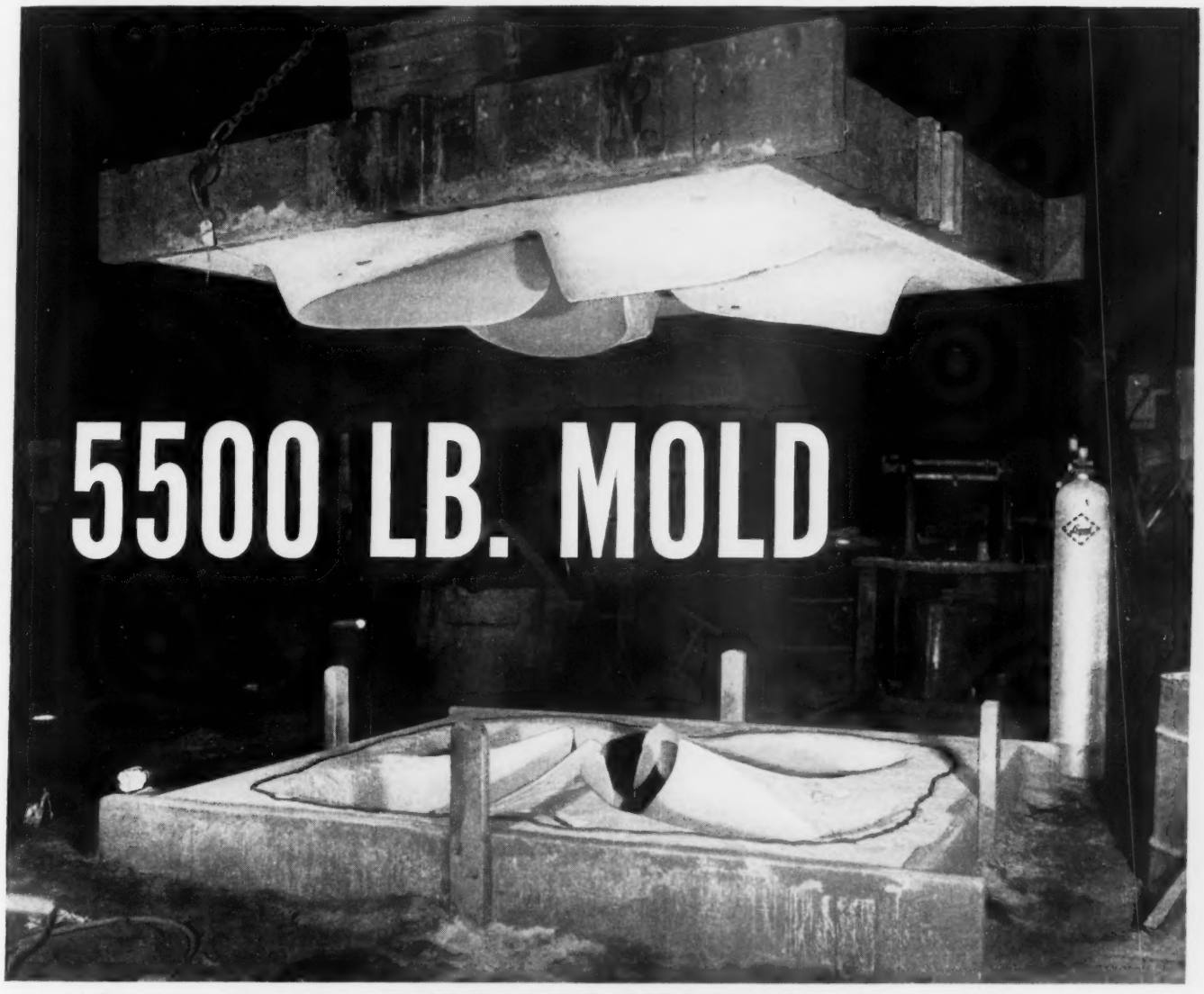
The machine will handle molds for producing many different castings produced in iron, aluminum alloys and copper-base alloys. Mr. Wagner claims that the machine cycle can be increased to 30 times an hour, depending upon casting design and type of metal poured.

The temperature at which the iron is poured for the manhole ring is approximately 2800 to 3000°F. No machining is required on the casting before it is put into service.




Sketch of permanent mold machine used to cast 200-lb manhole ring frames

# $CO_2$ CURES




# IN 40 MINUTES!

Fast, bakeless hardening of molds for large castings—like this one for 3400 pound nickel aluminum bronze propellers—is standard procedure at Columbian Bronze Corporation, Brooklyn, New York.

In addition to tremendous savings in time, Columbian Bronze reports these added advantages from $CO_2$ curing. no baking required • far fewer gaggers needed • elimination of need for extreme skill necessary in green sand molding • no danger of drops, soft spots or wet spots in mold • molds may be left for several days before pouring.

**For complete facts and technical data on how $CO_2$ mold curing will revolutionize your operation, contact**

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# Around the Country

NEWS REPORTS FROM

**Philadelphia . . . Chicago . . . New York . . . Pittsburgh . . . Cleveland**

***Cleveland***— The cornerstone of Cleveland's new Max S. Hayes Trade School was laid at an official ceremony Nov. 1. The new school is named after one of the city's outstanding early labor leaders who was a strong supporter of trades education. Joseph M. Gallagher, president, Cleveland Board of Education, presided at the ceremony. Short talks were made by members of the board, the general building contractors, labor leaders, D. C. Courtright, trade school principal, Alex Barczak, chairman of Northeastern Ohio Chapter, American Foundrymen's Society, and Mrs. Max S. Hayes.

Partial occupancy of the building is expected by the spring of 1957 and full occupancy by September. When complete, the building and its site will cost $2,822,854 plus $500,000 for equipment. Facilities will include 35 student workshops, 18 technical classrooms and 17 academic classrooms. There will be a cafeteria capable of seating about 450 students and a teachers' lunchroom with capacity for 40. In addition, there will be a well-lighted library with comfortable study chairs and tables, and a combination gymnasium-auditorium.

A well equipped foundry and pattern shop are included in the school's shops. An 18-in. ID cupola and a bridge crane already are installed. Other equipment will include an electric melting furnace, several different types of molding machines, flask equipment, a coreblower and an airless blast cleaning machine. The latter was donated by Northeastern Ohio Chapter, AFS.

Molding and melting operations will be conducted in a large, central room equipped with an exhaust system. Separate rooms opening off the main room at basement level will house coremaking and casting cleaning operations. Other small rooms will be used to store sand, coke and metal. Deliveries can be made to these rooms through ground level manholes in the ceiling.

The patternshop is a large rectangular room with windows forming one of the long sides. A classroom will be located at one end of the room. The shop will be equipped with modern power tools as well as hand tools for bench work. A milling machine was donated by Northeastern Ohio Chapter, AFS.

Present at the cornerstone laying for Cleveland's Max S. Hayes Trade School were, left to right; Mrs. Bert Davey, a daughter of the late Mr. Hayes; Alex Barczak, chairman, NEO chapter of AFS; D. C. Courtright, trade school principal, and Norma F. Wulff and Ralph W. Findley, members of the Board of Education

***Chicago***— Foundry executives seldom meet without discussing the growing need for engineers and technically trained personnel. This interest raises the question as to what the situation in this respect might be today had the Foundry Educational Foundation not been established.

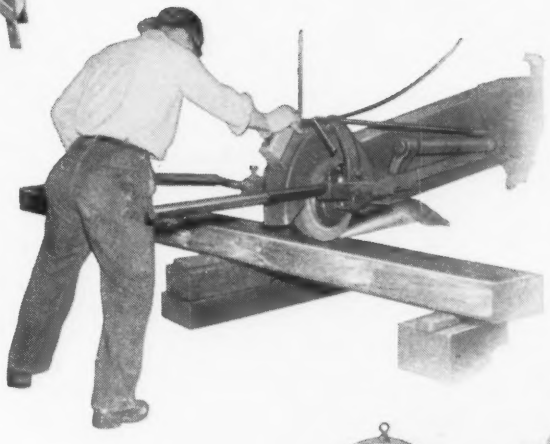
Nine years have passed since the FEF formally inaugurated its program of engineering training at five universities. Today the program embraces 16 schools where 6000 students are taking foundry courses.

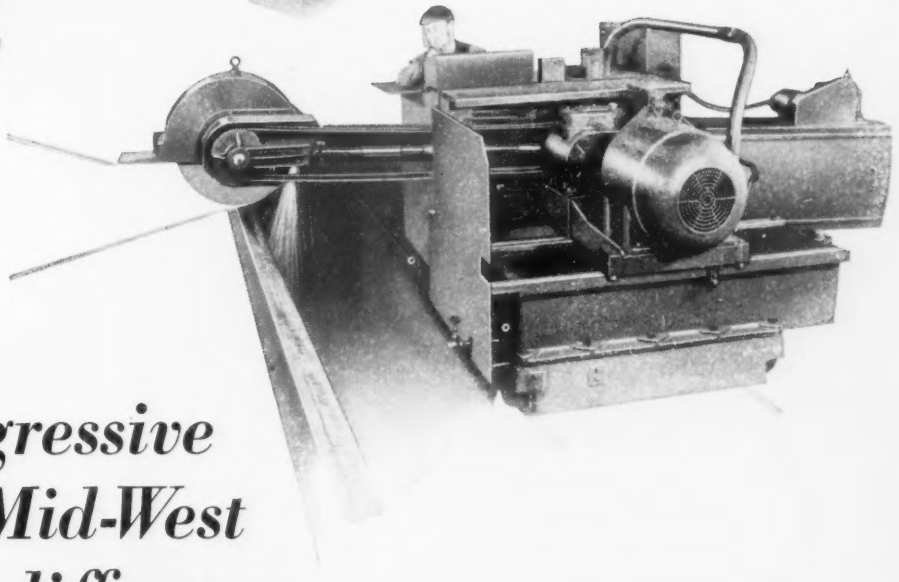
One of the newest participants in FEF is the Navy Pier Branch of the University of Illinois, Chicago. Reporting to the FEF Advisory Board for the first year (1955-56) of operation, Roy W. Schroeder, professor of foundry and pattern laboratories, reveals the extent to which the program is being accepted by students and the foundry industry and the high degree of support which the industry is giving outside of mere financial assistance.

Prof. Schroeder reports that Navy Pier Branch enrolled 85 students with FEF. From this group, 30 were employed by the foundry industry during the summer of 1956. Five were placed in full-time employment, and 25 were employed for the summer. Most were placed in the Chicago area, but employment was found for one in Michigan and for another in California. Reports indicate that the employers wish to have these students return for the 1957 summer period.

Students reported an enjoyable summer and indicate their desire to make the metal casting industry their life work. Several of the em-

# *Progress Means a Better Way of Doing Things...*





# *...and Progressive Thinking by Mid-West has made the difference*

It's a big step from the old foot-treadle grinding wheel to the hand-operated swing frame grinder. But: it's an even bigger step from the swing frame grinder to Mid-West's Automatic Grinding Machine, which today is reducing costs and increasing production in grinding operations at steel mills throughout the country.

Yet, progress such as this is a normal outgrowth of vigorous research engineering and development at Mid-West Abrasive, where "Progressive Thinking" dictates that normal progress is no longer adequate to meet today's highly competitive conditions. The result: highly skilled engineers and technicians are constantly developing newer products and maintaining top quality in all Mid-West products.

Discover what "Progressive Thinking" can do for you. Write for the name of your Mid-West representative. Get the story on the Mid-West line of grinding wheels, coated abrasives, honing stones, and abrasive grains.

*Mid-West wants to be more than just another source . . .*
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# JAXCOLITE!*

We don't imagine there has ever been a safety material devised that is so right for foundry use as Jaxcolite-coated asbestos, duck or burlap.

Jaxcolite is a new compound. It has been thoroughly tested, proved and approved. Applied to the materials mentioned above, *it provides exceptional* resistance to molten metal splash, to heat, to burn, to the strongest acids and caustics, and of course to oil and water. Yet it wears well, it is flexible, lightweight and comfortable. Its cost is low. And the amazing thing is that people who use it simply refuse to buy anything else.

Steel-Grip makes a complete line of safety apparel made from Jaxcolite materials. The list is shown on this page. We earnestly urge you to send for trial swatches of this material and make any tests you want. It may prove to be *THE* answer to safety problems long unsolved. Send today.

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TO BE SURE OF THE GENUINE, DEMAND THIS TRADE-MARK

1. **Amazing Jaxcolite Coated Materials are made up into Steel-Grip guaranteed quality safety apparel, VIZ:**

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| **Coats** | **Sleeves** |
| **Pants** | **Leggings** |
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**Gloves and Mitts with Jaxcolite backs**

**Curtains**

**Send for trial garment and prove its superiority for yourself.**

2. *We manufacture a complete line of safety apparel for every need, in leather, duck, Perma-Proof materials, asbestos, wool, Dynel cloth, Jaxcolite coated materials, aluminum coated materials, etc. These garments reflect in their materials, design and manufacture the high quality standards that have made Steel-Grip the outstanding supplier in the United States. Write for a catalog.*


ploying companies have agreed to maintain the students' membership in the AFS, have them as their guests at monthly AFS meetings, offer them work for the coming summer and grant a small scholarship to help pay for books and tuition. FEF scholarships were given to nine students.

Sixty students became AFS members, Prof. Schroeder continues, with half of the fee paid by themselves and the other half by special funds made available through efforts of Advisory Board members. The students have been guests at Chicago Chapter meetings, the number at each meeting varying between 20 and 40. A total of 223 dinners were provided for students by industry members. George Edwards, president of Woodruff & Edwards Inc. and treasurer of the Advisory Board, collected $495 to meet expenses incidental to maintenance of interest —shop trips, dinners, AFS membership, etc.

Through excellent co-operation of the Advisory Board, over 30 per cent of all mechanical engineering students enrolled in the shop laboratory classes worked in the industry full or part-time.

* * *

Foundries in Chicago will want to be on the alert for impending changes in zoning laws. A number of changes proposed some time ago now are being revised in line with criticism received. Included in the new draft will be standards on smoke and noise, and these are likely to be pretty rigid. It is reported that unless there is extensive modification in the original proposals, the impact on foundries as well as on other industries may be serious.

***New York***— Gray iron demand is easing off. Most shops are still operating five days a week, but backlogs are tapering and this trend is likely to prevail throughout the remainder of the year.

Light squeezer work definitely is less active. It is doubtful that backlogs of foundries engaged in this work average two weeks. Although there is an easing in machine tool casting specifications, heavy work still is fairly active, with backlogs running possibly six to seven weeks. Demand for castings for road work is still holding up well.

The small steel and malleable casting capacity in this area is well engaged, with backlogs extended. Red metal shops are operating on a hand-to-mouth basis almost without back-

# *The Spirit of Fifty Seven*

Our wish for this Holiday Season is that the same gaiety, warmth and good fellowship abounding during Christmas and New Year's remain with each one of us throughout the coming year. When the Holiday Season becomes just an afterglow in our memories, may we not bury, in the crush of everyday living, the dreams and hopes and goals we pledged to make a reality. May we all carry this happiest of spirits in our hearts throughout nineteen hundred and fifty-seven. We, at Cedar Heights, wish to extend our deepest thanks for the consideration you have given us throughout this past year. Our New Year's resolution: that each customer receives the finest in products and service this year and every year.

**CEDAR HEIGHTS CLAY** **COMPANY**

logs except for captive shops producing industrial pumps and valves and maritime work. Large meter work is still fairly active, reflecting requirements of large new apartments and commercial buildings. But the decline in residential housing has affected light meter work considerably and also has cut into plumbing supplies and hardware.

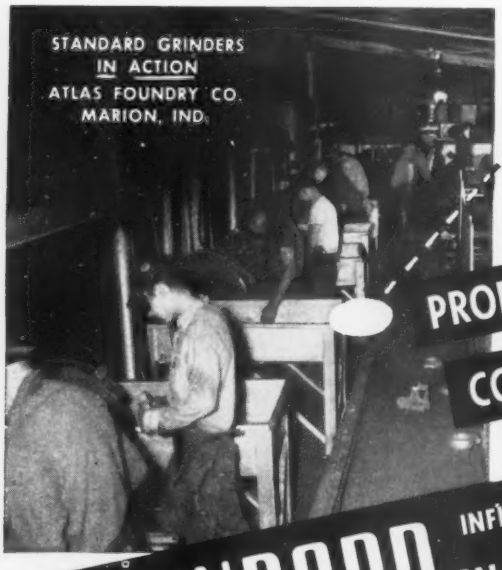
Bethlehem's withdrawal from the merchant pig iron market Jan. 1 will not have too great a bearing in this district. The temporary withdrawal of Alan Wood Steel Co. around the first of the year to rehabilitate and enlarge its smaller furnace probably will be felt more seriously while it lasts.

***Pittsburgh***— Most ferrous foundries here enjoyed a strong fourth quarter. Steel mills anticipate near-capacity operations for several months, and their demand for equipment is heavy. Blaw-Knox Co., for example, entered the fourth quarter with a $140 million backlog, compared with $111 million at the beginning of the year. Commercial orders made up more than 90 per cent of that backlog.

Other large equipment suppliers are equally busy. Steel foundrymen are the most optimistic about the future. Captive foundries continue to bolster their capacities. Mesta Machine Co. is pushing to complete its New Castle, Pa., program, and United Engineering & Foundry Co. is doing the same at Vandergrift, Pa.

The only disappointing trends appear in some nonferrous foundry operations. Suppliers of aluminum castings have reported a decline in orders from automotive producers.

Producers of copper-base castings still enjoy good backlogs, but the volume of new orders has declined.


X MARKS THE SPOT . . . where

PRODUCTION'S UP 28%

COST IS DOWN 23%

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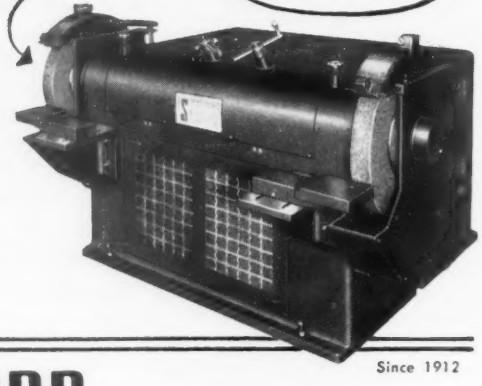
HAND WHEEL Automatically ADJUSTS WHEEL SPEED!



Castings are on the move in Marion! . . . costs cut, production upped, shut-down time nil. And that's the story wherever STANDARD'S Twin-Wheel Snagging Grinders are on the job! Sizes to 100 hp, 20" to 30" wheels. Get the facts today . . . facts that mean a new kind of profit-FUTURE for your foundry. WRITE FOR LITERATURE.

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***Philadelphia***— Most gray iron shops appear to be holding their own, though over-all business is a shade easier. Foundries are working five days a week, but backlogs are not quite as extended. This applies to heavy as well as light work. Some plants engaged in heavy production now report backlogs of seven or eight weeks, as against eight to ten weeks a month ago; as for light work, backlogs appear around two to three weeks.

Demand stays brisk for heavy industrial and electrical equipment and papermaking machinery. Textile machinery lags, however, and agricultural equipment and soil pipe specifications are tapering seasonally.

Steel foundries continue busy, reflecting heavy industrial work although little defense business. Backlogs easily average eight to ten weeks. Malleable shops are doing well—especially those engaged in production of pipe fittings. Operations in steel foundries run five and a half days a week in some shops.

Except for some light metal shops tied in closely with aircraft work, nonferrous foundries are only moderately active. Plumbing supplies and builders hardware definitely are off, reflecting the drop in housing construction. This drop also is seen in meters. Most nonferrous shops have light backlogs with no signs of early improvement.

Permanent withdrawal of Bethlehem Steel Co. from the merchant pig iron market as of next Jan. 1 has sent various foundries scurrying for new sources of supply. Bethlehem's decision comes with special impact because of the temporary withdrawal of Alan Wood Steel Co. at that time to rehabilitate and enlarge its smaller furnace—a matter requiring possibly five months.



Circle 674 on Inquiry Card—Page 217

Circle 675 on Inquiry Card→

# *Shell Core Blowing is faster than ever...*

## with new RESINOX* Cold Coating Resins

**SHELL CORES** typical of results of blow-molding with Resinox-coated sands. Note clean, sharp edges, intricate detail.

## *Increased production cycle now possible with improved Monsanto phenolic resins*

Now, with new Resinox cold coating resins, an operator can turn out cores completely cured and ready to set in 30 to 60 seconds . . . or less!

Developed in the Monsanto Foundry Research Laboratories, and fully field-tested, these Resinox phenolic resins are fast-curing, free-flowing, non-dusting. They won't cake under normal storage conditions. A small amount of resin gives cores the strength to eliminate rod and wire reinforcing materials. Cores are light in weight and can be stored indefinitely. Most important, the castings have excellent dimensional stability and require little or no machining.

There are many reasons for the fast-growing use of shell core blowing—smoother surfaces, sharper detail, closer tolerances, and quicker curing time with cold coated resins. Send for data sheets and literature on these new Resinox Cold Coating Resins. Write Monsanto Chemical Company, Plastics Division, Room 455, Springfield 2, Mass.

MONSANTO

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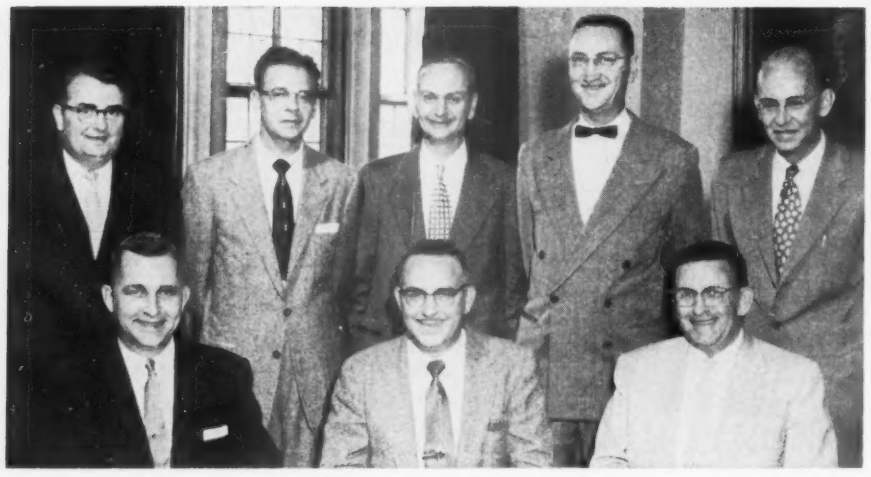


Members of the conference committee present for the photograph, left to right, front row, were T. E. Smith, Central Foundry Division, GMC, J. C. Maggart, Sibley Foundry & Machine Co. and Carl Schopp, Link-Belt Co. In the back row, left to right, are Dallas Lunsford, Perfect Circle Corp., R. H. Greenlee, Auto Specialties Mfg. Co. C. T. Marek, Purdue University, H. B. Voorhees, Buckeye Products Co., and R. Schuhmann Jr., Purdue University

# Meeting the Customer's Demands

## *Is Theme of Purdue Conference*

By ERLE F. ROSS
*Chicago Editor*
and
KENNETH L. MOUNTAIN
*Associate Editor*

THEME of the Metals Casting Conference at Purdue University, Oct. 25-26, was "The Customer's Demands," and technical papers and addresses adhered closely to it. This was the ninth annual event sponsored by the university's School of Chemical and Metallurgical Engineering and Division of Adult Education, and the Central Indiana and Michiana Chapters of the American Foundrymen's Society.

Registered attendance exceeded 150, but participation was broadened with students in foundry classes sitting in at various sessions.

R. H. Greenlee, plant superintendent, Auto Specialties Mfg. Co., St. Joseph, Mich., was conference chairman. Carl O. Schopp, assistant general superintendent, Link-Belt Co., Indianapolis, was program chairman, and W. E. Patterson, vice president, Elkhart Foundry & Machine Co., Elkhart, Ind., was assistant program chairman.

Committee members included: Dallas Lunsford, chief metallurgist, Perfect Circle Corp., Hagerstown, Ind.; James C. Maggart, core room and shell molding supervisor, Sibley Machine & Foundry Corp., South Bend, Ind.; Victor J. Obrig, chief metallurgist, Fabricast Division, General Motors Corp., Bedford, Ind.; T. E. Smith, factory manager, Danville, Ill., plant, Central Foundry Division, General Motors Corp.; H. B. Voorhees, sales engineer, Buckeye Products Co., Cincinnati; and the following from Purdue University: R. W. Lindley, professor of industrial engineering; R. Schuhmann Jr., in charge of metallurgical engineering and metal processing; C. T. Marek, professor of metal processing and in charge of foundry; and K. E. Glancy, conference supervisor, Division of Adult Education.

Prof. R. Schuhmann Jr. presided at the opening session, at which Dean G. A. Hawkins, schools of engineering, welcomed the conference participants. He briefed the history of the university, its interest as a state institution in turning out engineers for industry, and how this objective is impeded by the desperate need for teachers.

Dean Hawkins stated that teachers are leaving their posts for positions in industry because remuneration is considerably better. At the same time, engineering schools are under constant and increasing pressure to train more engineers to accommodate industry's needs.

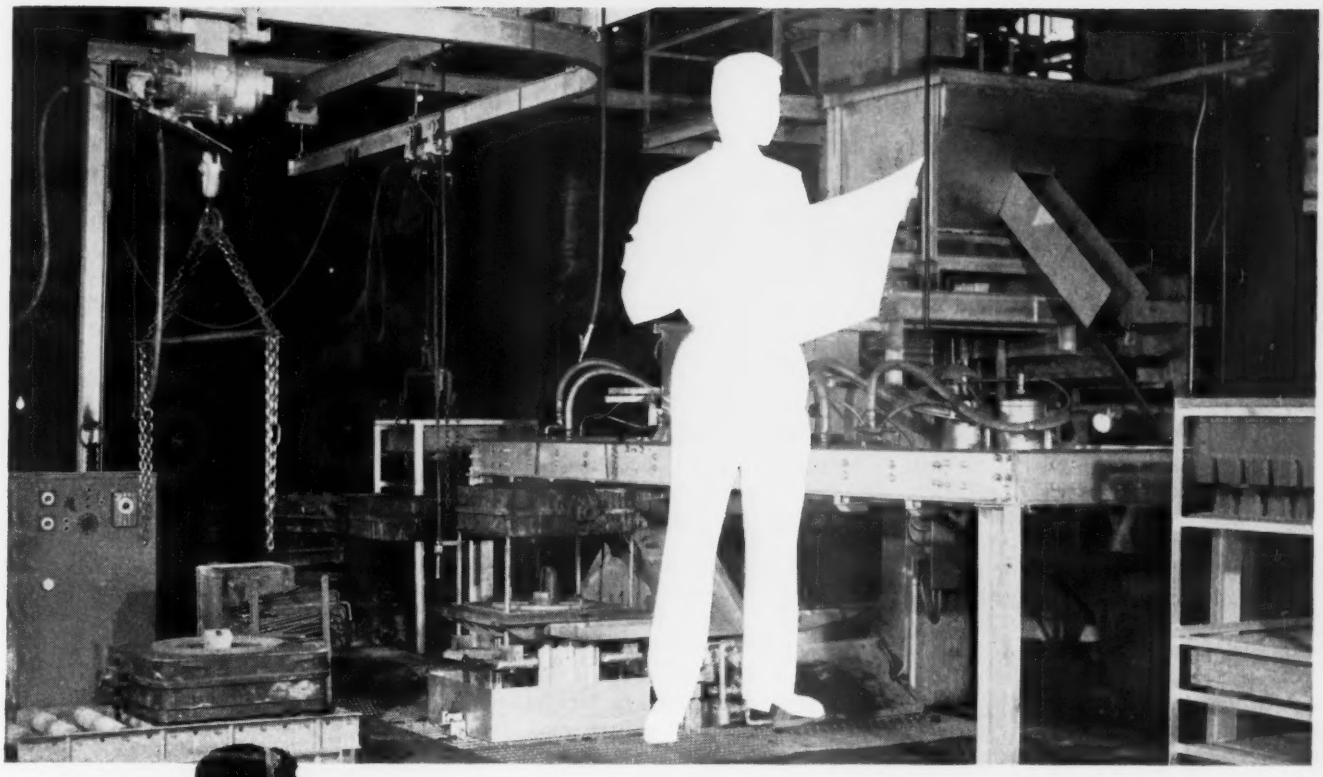
Responding to Dean Hawkins' welcome on behalf of industry, C. V. Nass, vice president, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago, and regional vice president of the American Foundrymen's Society, emphasized that the conference theme of "The Customer's Demands" dictates every management decision. The foundry industry is undergoing change as it moves from an art to a science. It is especially important, therefore, to be alert to the new demands which customers are placing on foundries.

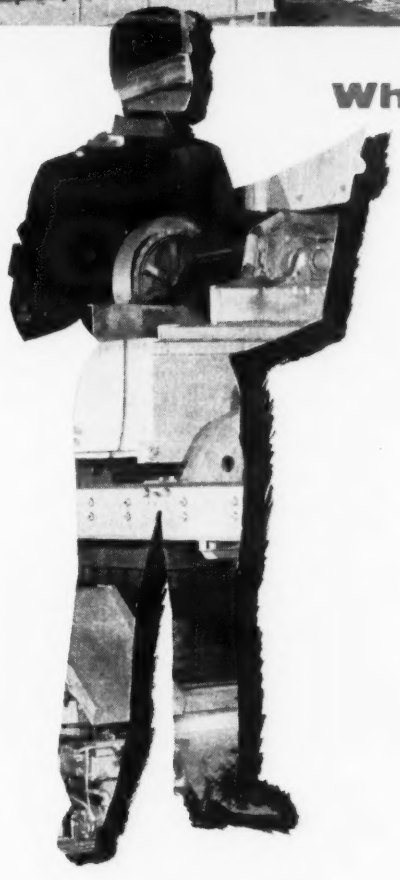
Continuing, he said that the foundry industry can't move forward without technically trained men. Only some 30,000 new engineers were available to all industries last year and of this number obviously only a small per cent was available to the foundry industry.

Mr. Nass was highly complimentary of the Foundry Educational Foundation, which, organized only nine years ago, has graduated 1600 engineers in the foundry and allied industries. The colleges participating in the program have expanded from the original 5 to 16 and at present over 6000 students are taking courses at foundry schools.

In the principal address of the opening session, Collins L. Carter, president and general manager, Albion Malleable Iron Co., Albion, Mich., underscored the conference theme in speaking on "Customer Demand and Foundry Markets." In 1955, some 19 million tons of castings were made in 5800 foundries and it is estimated 1956 production will be equally as great despite the dips in automobile and farm machinery output this year. This is a 45 per cent increase over end of World War II. Mr. Carter believes the current trend will continue and that by 1976 foundries could produce 26 million tons. This would be double 1949 output.

However, Mr. Carter cautioned that such a forecast can come true only as foundries make an end product that is acceptable to their customers. Machinability, accuracy of dimensions and final costs are prime





## Who is your foundry's future?

Stand back for a moment and look at your foundry. Strip it down to its components. What gives it substance?

"Man, of course". you say, "the individual who blends the ingredients into a productive whole."

And it is also upon man that the growth and development of your foundry depend . . . man technically trained and soundly indoctrinated in the field of foundry science and engineering.

But what investment are you making in that man; what are you contributing to his education today, for your greater benefit tomorrow?

Through the efforts of the Foundry Educational Foundation, and its participating members, about two hundred fifty graduate engineers are available to the foundry and allied industries annually. How many will your foundry absorb to insure its future; how many can you claim as a big return on a small investment?

*Write today for our detailed booklet, "Let's Look Ahead".*

# Foundry Educational Foundation

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considerations. The speaker cited some of the modern requirements in castings because of higher speeds and power in automobiles and other forms of transportation. Impact of automation is being felt because of the necessity of accurate dimensions and uniformity of machinability in transfer types of machining lines. Because of these demands, foundries have installed unprecedented controls.

Mr. Carter pointed out that the foundry industry has a chance to participate importantly in the armament program if its product provides the required properties and meets cost conditions. Competition for this business as well as civilian markets forces foundries to advance their techniques and materials.

Frank W. Shipley, foundry manager, Caterpillar Tractor Co., Peoria, Ill., and national president of the American Foundrymen's Society, brought the opening session to a close with a few comments, chief among which was that changes in the foundry industry in the next 25 years are going to be tremendous. He thanked Purdue and other engineering schools for the part they are taking in assisting the foundry industry to improve its processes and materials through holding of conferences and conducting research. Mr. Shipley also mentioned that the AFS convention in Cincinnati next May will present an innovation—an exhibit limited to castings for sale, patterns, testing equipment, and metals and alloys. He emphasized that the foundry industry can't place too much stress on education.

Second session of the conference featured a discussion on "Effect of Design on Making of a Casting" by W. M. Ball Jr., metallurgist and foundry consultant, R. Lavin & Sons Co., Chicago. Floyd J. Crowley, metallurgist, Benton Harbor Malleable Iron Co., Benton Harbor, Mich., acted as chairman at the session.

By dictionary definition, Mr. Ball asserted, design is a drawing of something to be executed as a whole. Unfortunately, he ventured, design of castings often is made by someone who is not familiar with casting methods. Requirements of good design are that the casting have a definite shape—simple or complex; and that the shape be compatible with the properties and characteristics of the metals to be used.

For example, the designer should know metal analyses and behavior of the various metal groups. He must know whether the castings must be pressure tight, whether the castings are to be plated and what corrosion resistance is required. Metals vary considerably in their ability to meet these requirements. Mr. Ball contends that the fellow who makes the casting should have something to say about making the pattern.

The designer must be able to design to a price, must be familiar with melting practice and pouring temperatures and he must know how to provide gates and risers. It is important that the designer know the principles of feeding as well as the feeding characteristics of various metals. He must also know how to use special cores.

The second paper at this session tied in directly with the conference theme. It was presented by B. C. Yearley, engineering assistant to vice president, National Malleable & Steel Castings Co., Cleveland, and the title was "Meeting the Customers' Requirements." R. H. Brooke, foundry superintendent, Link-Belt Co., Indianapolis, presided.

Price and quality are tied together so closely they can't be separated, the speaker said. The final price is the cost of the castings plus the processing. Dimensional consistency, freedom from defects and machinability are the three top demands of castings users, said Mr. Yearley, and inability of the foundryman to provide the first and second have probably done the most to retard the use of castings.

If dimensional consistency can't be given, what does the machinist think of the foundry process, he asked, for in setting up machining procedures allowances must be made for maximum cuts to be taken, and this adds to costs. It is imperative that foundries develop some means of providing greater dimensional consistency in castings.

Inability to control defects causes designers to question the materials they use, the speaker said. Some way must be found to eliminate gas or blowholes in castings. In this connection, it would appear necessary to develop inorganic binders which do not develop gas. Maybe sodium silicate is a step in that direction. The foundryman also must develop metal that is free from nonmetallic inclusions, particularly the abrasive type. These affect tool costs in machining.

The most insidious defect is cracks, and foundrymen can expect more pressure from customers for elimination of cracks and surface checking. It appears that cracking occurs just after the metal freezes, but what are we doing about it, Mr. Yearley asked. We should determine a design that will produce minimum cracks and use metal that shows the least cracking tendency. The customer is interested importantly in machinability, and most complaints the foundryman receives are tied up with surface defects. In conclusion, Mr. Yearley said the foundryman's problem is to convince the customer there are no hidden defects in the castings they produce.

At the banquet held Thursday evening, some 20 students enrolled in the Foundry Educational Foundation program were guests of foundrymen attending the conference. Prof. R. W. Lindley, department of industrial engineering, Purdue University, was toastmaster, and Edward A. McFaul, international lecturer, Chicago, spoke and entertained under the title of "With Your Hat in Your Hand." Interwoven in the speaker's generous recitation of stories and anecdotes was a serious message on the consideration executives, superintendents, foremen and other supervisory personnel should give to those immediately under them.

J. S. Schumacher, chief engineer, Hill & Griffith Co., Cincinnati, opened the third session with a discussion "Concerning Sand." Robert Hall, superintendent, Castings Service Corp., La Porte, Ind., served as chair-

Panelists for the shell mold discussion were, left to right, Ladd C. Shramek, Bendix Aviation Corp., Lake Shore Division, T. E. Smith, Central Foundry Division, General Motors Corp., Richard G. Wiest, Dalton Foundries, moderator, V. A. Baldwin, Sibley Foundry & Machine Co., and Carl Schopp, Link-Belt Co.

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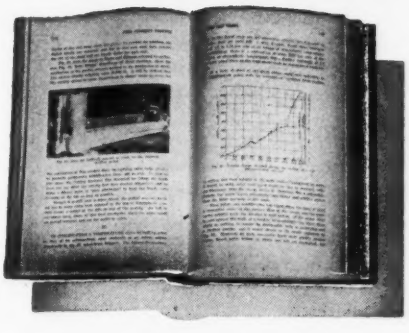

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**ABOUT THE AUTHOR**

*The late John Howe Hall was associated with the production of steel castings for nearly 50 years. Mr. Hall received his bachelor's and master's degrees from Harvard University. He was employed by Bethlehem Steel Co. and Buffalo Crucible Castings Co. until 1906, when he joined Taylor-Wharton Iron & Steel Co. He remained there until 1937, when he became a consulting metallurgist. His previous major work was* The Steel Foundry, *published in 1914, with a second edition in 1922.*

*Mr. Hall was the author of many papers presented before the American Society for Testing Materials, the American Foundrymen's Society, the American Institute of Mining and Metallurgical Engineers and the American Society of Mechanical Engineers. In 1924, he received the first Whiting Medal awarded by the AFS.*

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man. Mr. Schumacher said there is no universal solution to all foundry problems but the industry must continue to perfect procedures, controls and formulas that will meet changing needs and demands. Good sand control is a matter of correlated statistics and sand control laboratory responsibility. Screen analysis is important as are controls which will predict whether a sand has the properties capable of turning out a good casting.

The speaker suggested that sands

J. S. Schumacher, left, Hill & Griffith Co., talked on "Concerning Sand." Robert Hall, right, Castings Service Corp., was chairman of the session

must be tested at levels in the laboratory that coincide with conditions in the shop. Not all the fault lies with the sand when procedures and methods are not uniform. Sand handling and molding methods, sand density, moisture, physical characteristics of additives and pouring speeds were discussed as factors playing a vital role in producing dimensionally accurate castings. In closing, Mr. Schumacher urged foundrymen to take another look at green sand practices and controls as he feels that proper choice of sands and molding methods will permit casting with precision in green sand.

Richard G. Wiest, metallurgist, Dalton Foundries, Warsaw, Ind., moderated a shell molding panel discussion that featured as panel members Carl O. Schopp, Tom E. Smith, Ladd C. Shramek, general foundry superintendent, Bendix Aviation Corp., Lake Shore Division, St. Joseph, Mich., and Victor A. Baldwin, foundry superintendent, Sibley Machine & Foundry Co., South Bend, Ind.

Each panelist briefly outlined the shell molding operation at his plant with general information provided on the type of equipment, resins,

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*Circle 679 on Inquiry Card—Page 217*


coreboxes, scrap, types of castings being made and general production problems. In reply to questions from the floor it was learned that scrap percentages generally averaged 14 to 16 per cent on production runs in all four operations, with higher percentages present on some particularly difficult jobs; pouring is generally done horizontally; cooling times are controlled for individual jobs; gating differs from conventional sand gating practice and has to be worked out for each particular job; water wax emulsions, silicone release agents or a rice hull blast are used to remove build-up on patterns.

At the concluding conference session, Ed Oakley, assistant supervisor of inspection, Delco-Remy Division, General Motors Corp., Anderson, Ind., spoke on "Can Casting Quality Be Improved?" Dallas Lunsford, chief metallurgist, Perfect Circle Corp., Hagerstown, Ind., served as chairman.

### Controls Will Give Results

The speaker answered the question affirmatively and gave a convincing demonstration of how statistical quality control is the tool to accomplish the result. He defined statistical quality control as the science of collecting, measuring, analyzing and interpreting quantitative factors.

Mr. Oakley used a pinball machine to show how marbles dropping vertically will come to a rest in such a manner as to develop a pattern. Then with use of color slides he showed how castings or other manufactured parts can be measured dimensionally or physically so that the tabulation of results fall into a pattern which is useful in suggesting changes in the manufacturing process to improve the product.

He warned that the decision on what to do in changing a process should be based on a number of readings or figures and not just a few. Things do vary; however, they vary in a pattern which can be analyzed and interpreted. Charts indicated with considerable positiveness how statistical control is improving quality of products and reducing waste.

The procedure would be of little value to a foundry where only a few castings are to be made. Its greatest use is where repetitive production is involved and where conditions of manufacture can vary. There are occasions where there is no time to count a lot of pieces; in such cases representative sampling can be made and from this sampling and use of charts it is possible to predict what would happen if all pieces are counted.


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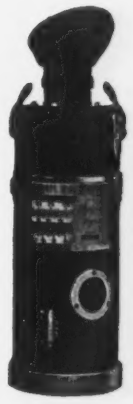

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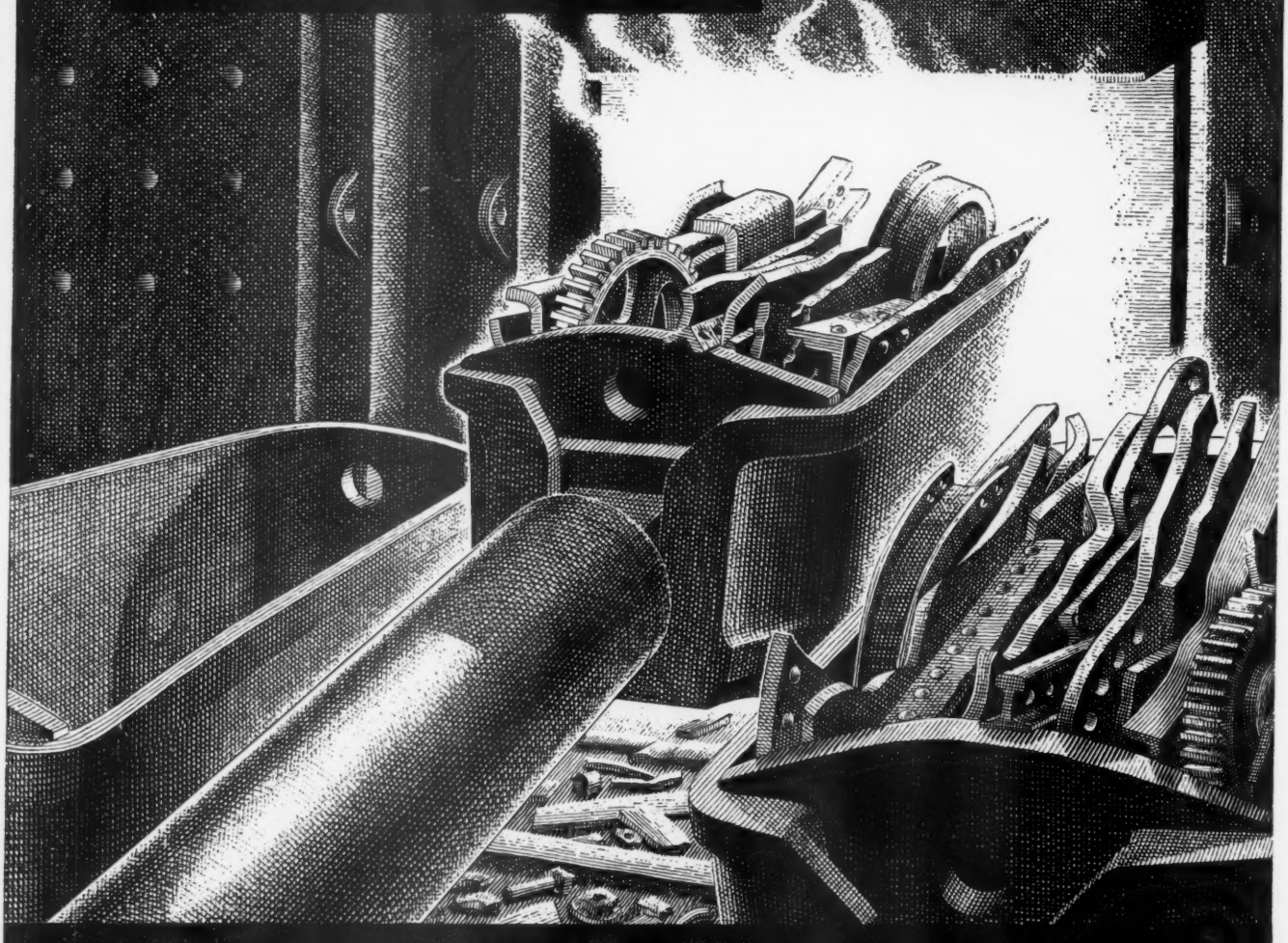

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# Foundry Statistics

## ALUMINUM

(Shipments of castings—1000 pounds[1])

| | Shipments | | | | Unfilled Orders[2] |
|---|---|---|---|---|---|
| | Total | Sand | Perm. Mold | Die | |
| 1954 | 624,973 | 158,473 | 214,408 | 245,291 | ..... |
| 1955 | | | | | |
| Aug. | 64,864 | 14,916 | 22,267 | 27,004 | 105,994 |
| 8 mo. | 543,351 | 112,784 | 198,607 | 226,332 | ..... |
| Sept. | 67,069 | 14,769 | 23,075 | 28,532 | 111,696 |
| Oct. | 72,197 | 14,485 | 25,135 | 31,741 | 120,222 |
| Nov. | 75,065 | 14,327 | 26,267 | 33,852 | 126,954 |
| Dec. | 75,275 | 15,291 | 25,031 | 34,347 | 123,363 |
| Total | 832,957 | 171,656 | 298,115 | 354,804 | ..... |
| 1956 | | | | | |
| Jan. | 74,152 | 15,861 | 24,528 | 33,253 | 121,924 |
| Feb. | 73,096 | 15,560 | 23,963 | 32,949 | 115,958 |
| Mar. | 73,785 | 16,597 | 22,816 | 33,965 | 110,642 |
| Apr. | 67,880 | 14,732 | 20,718 | 31,782 | 106,477 |
| May | 65,786 | 15,570 | 19,699 | 29,814 | 102,121 |
| June | 58,189 | 13,448 | 19,067 | 25,027 | 102,068 |
| July | 52,955 | 12,398 | 16,388 | 23,491 | 106,620 |
| Aug. | 61,528 | 13,100 | 18,067 | 29,674 | 109,352 |
| 8 mo. | 527,371 | 117,266 | 165,246 | 239,955 | ..... |

## MALLEABLE IRON

(Shipments of castings—net tons[1])

| | Shipments | | Standard | | Pearlitic | | Unfilled Orders[2] |
|---|---|---|---|---|---|---|---|
| | Total | For Sale | Total | For Sale | Total | For Sale | |
| 1954 | 812,016 | 461,982 | ..... | ..... | ..... | ..... | ..... |
| 1955 | | | | | | | |
| Aug. | 82,448 | 48,126 | ..... | ..... | ..... | ..... | 123,473 |
| 8 mo. | 751,354 | 440,146 | ..... | ..... | ..... | ..... | ..... |
| Sept. | 87,215 | 55,471 | ..... | ..... | ..... | ..... | 116,636 |
| Oct. | 90,866 | 53,804 | ..... | ..... | ..... | ..... | 121,261 |
| Nov. | 99,280 | 58,069 | ..... | ..... | ..... | ..... | 116,981 |
| Dec. | 99,946 | 60,409 | ..... | ..... | ..... | ..... | 123,107 |
| Total | 1,104,775 | 652,552 | ..... | ..... | ..... | ..... | ..... |
| 1956 | | | | | | | |
| Jan. | 93,562 | 54,618 | 79,406 | 45,747 | 14,156 | 8,871 | 116,520 |
| Feb. | 93,533 | 54,466 | 80,601 | 47,606 | 12,932 | 6,860 | 113,616 |
| Mar. | 86,941 | 46,266 | 75,384 | 40,869 | 11,557 | 5,397 | 106,491 |
| Apr. | 83,320 | 47,064 | 72,763 | 41,449 | 10,557 | 5,615 | 99,573 |
| May | 80,138 | 51,053 | 69,593 | 44,424 | 10,545 | 6,629 | 93,677 |
| June | 75,635 | 45,022 | 66,300 | 26,791 | 9,335 | 5,513 | 86,247 |
| July | 54,340 | 31,300 | 45,977 | 26,881 | 8,363 | 4,419 | 92,078 |
| Aug. | 74,422 | 43,479 | 62,867 | 36,759 | 11,555 | 6,720 | 91,883 |
| 8 mo. | 641,891 | 373,268 | 552,891 | 310,526 | 89,000 | 50,024 | ..... |

## COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

| | Shipments | | | Unfilled Orders[2] |
|---|---|---|---|---|
| | Total | Sand | Perm. Mold | |
| 1954 | 835,930 | 753,179 | 48,848 | ..... |
| 1955 | | | | |
| Aug. | 87,206 | 77,721 | 5,322 | 51,251 |
| 8 mo. | 652,324 | 585,152 | 40,750 | ..... |
| Sept. | 89,600 | 80,481 | 5,603 | 57,313 |
| Oct. | 91,192 | 82,958 | 4,513 | 56,751 |
| Nov. | 90,345 | 80,934 | 5,807 | 57,049 |
| Dec. | 88,287 | 78,327 | 6,368 | 57,146 |
| Total | 1,011,748 | 907,852 | 82,201 | ..... |
| 1956 | | | | |
| Jan. | 89,767 | 80,116 | 6,135 | 58,445 |
| Feb. | 91,706 | 82,244 | 5,888 | 57,515 |
| Mar. | 96,085 | 85,094 | 6,299 | 65,560 |
| Apr. | 90,679 | 81,333 | 5,835 | 68,106 |
| May | 89,188 | 80,105 | 5,448 | 58,789 |
| June | 78,921 | 70,260 | 5,052 | 55,019 |
| July | 60,926 | 55,027 | 3,193 | 59,661 |
| Aug. | 77,619 | 70,479 | 3,805 | 56,364 |
| 8 mo. | 674,891 | 604,658 | 41,655 | ..... |

## MAGNESIUM

(Shipments of Castings—1000 pounds[1])

| | Shipments | | Unfilled Orders[2] |
|---|---|---|---|
| | Total | For Sale | |
| 1954 | 25,777 | 22,950 | ..... |
| 1955 | | | |
| Aug. | 2,176 | 2,002 | 5,964 |
| 8 mo. | 18,532 | 16,829 | ..... |
| Sept. | 2,478 | 2,260 | 5,670 |
| Oct. | 2,302 | 2,077 | 5,394 |
| Nov. | 2,325 | 2,148 | 5,805 |
| Dec. | 2,255 | 2,018 | 5,981 |
| Total | 27,892 | 25,332 | ..... |
| 1956 | | | |
| Jan. | 2,959 | 2,600 | 6,237 |
| Feb. | 2,977 | 2,720 | 6,704 |
| Mar. | 3,046 | 2,842 | 6,414 |
| Apr. | 3,140 | 2,949 | 7,137 |
| May | 3,021 | 2,801 | 7,293 |
| June | 2,949 | 2,765 | 7,850 |
| July | 2,810 | 2,666 | 7,937 |
| Aug. | 3,049 | 2,860 | 8,201 |
| 8 mo. | 23,951 | 22,203 | ..... |

## PRODUCTION WORKERS

### Estimated Number

| | Aug. 1956 | July 1956 | Aug. 1955 |
|---|---|---|---|
| Ferrous | 203,300 | 200,900 | 204,600 |
| Nonferrous | 61,400 | 60,300 | 61,500 |

### Average Weekly Earnings

| | | | |
|---|---|---|---|
| Gray Iron | 84.05 | 82.41 | 82.59 |
| Malleable Iron | 80.96 | 81.19 | 81.59 |
| Steel | 93.41 | 93.66 | 88.62 |
| Nonferrous | 89.57 | 89.13 | 84.03 |

### Average Weekly Hours

| | | | |
|---|---|---|---|
| Gray Iron | 40.8 | 40.2 | 41.5 |
| Malleable Iron | 39.3 | 39.8 | 41.0 |
| Steel | 41.7 | 42.0 | 42.0 |
| Nonferrous | 40.9 | 40.7 | 40.4 |

Source: Bureau of Labor Statistics

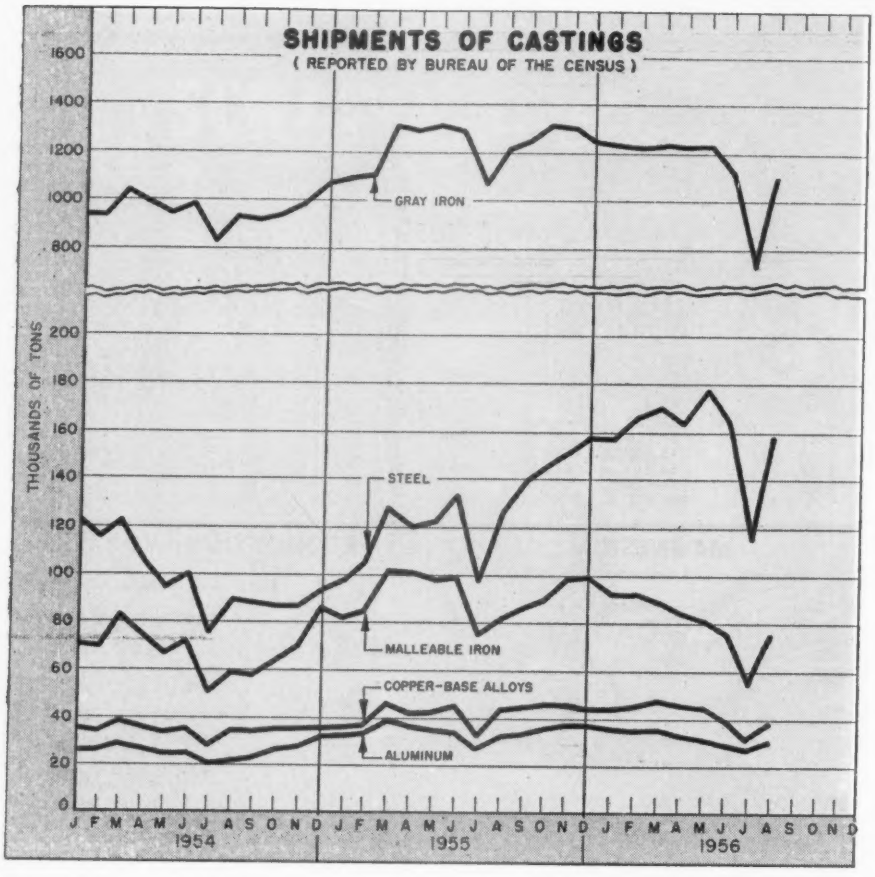
## GRAY IRON CASTINGS—SHIPMENTS (Net Tons[1])

| | All Castings | | Miscellaneous Castings | | Heavy Steel Ingot Molds | | Chilled Railroad Car Wheels | Pressure Pipe & Fittings | Soil Pipe & Fittings | Unfilled Orders[2] |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | For Sale | Total | For Sale | Total | For Sale | Total | Total[3] | Total[3] | |
| 1954 | 11,532,158 | 6,322,989 | 7,292,292 | 3,064,886 | 1,784,625 | 843,899 | 325,859 | 1,376,671 | 743,711 | ..... |
| 1955 | | | | | | | | | | |
| Aug. | 1,226,312 | 688,317 | 718,423 | 301,502 | 238,007 | 121,071 | 29,298 | 156,074 | 84,510 | 1,160,466 |
| 8 mo. | 9,935,812 | 5,337,070 | 6,208,601 | 2,499,111 | 1,743,268 | 889,412 | 278,209 | 1,091,088 | 614,646 | ..... |
| Sept. | 1,252,736 | 712,688 | 731,073 | 314,223 | 244,199 | 124,811 | 29,953 | 165,332 | 82,179 | 1,150,933 |
| Oct. | 1,310,309 | 713,671 | 795,875 | 327,827 | 245,749 | 122,722 | 31,877 | 160,875 | 75,923 | 1,113,336 |
| Nov. | 1,305,633 | 696,523 | 797,854 | 327,580 | 262,506 | 127,739 | 29,795 | 148,560 | 66,918 | 1,061,546 |
| Dec. | 1,259,740 | 633,993 | 786,480 | 328,445 | 262,056 | 133,115 | 30,833 | 133,935 | 46,436 | 1,075,477 |
| Total | 14,837,745 | 7,987,205 | 9,161,685 | 3,715,963 | 2,739,864 | 1,392,209 | 385,041 | 1,681,630 | 869,558 | ..... |
| 1956 | | | | | | | | | | |
| Jan. | 1,249,518 | 677,017 | 769,826 | 326,269 | 257,150 | 132,581 | 32,408 | 131,346 | 58,788 | 1,157,818 |
| Feb. | 1,214,769 | 680,494 | 739,786 | 322,956 | 242,207 | 128,643 | 35,074 | 133,254 | 64,448 | 1,140,765 |
| Mar. | 1,255,405 | 715,173 | 752,498 | 331,749 | 254,045 | 139,624 | 42,676 | 132,384 | 73,802 | 1,162,578 |
| Apr. | 1,218,000 | 702,145 | 719,109 | 314,968 | 237,486 | 130,473 | 39,325 | 151,670 | 70,410 | 1,144,870 |
| May | 1,235,631 | 737,081 | 702,834 | 321,413 | 243,719 | 131,294 | 38,419 | 171,859 | 78,800 | 1,086,122 |
| June | 1,152,156 | 686,896 | 656,778 | 298,578 | 217,135 | 102,405 | 34,028 | 170,122 | 74,093 | 1,041,315 |
| July | 762,611 | 487,736 | 509,702 | 241,771 | 9,556 | 7,003 | 32,484 | 144,964 | 65,905 | 1,109,069 |
| Aug. | 1,103,195 | 671,523 | 639,953 | 293,673 | 170,857 | 89,589 | 31,712 | 180,249 | 80,424 | 1,074,461 |
| 8 mo. | 9,191,285 | 5,358,065 | 5,490,486 | 2,451,377 | 1,632,155 | 861,612 | 286,126 | 1,215,848 | 566,670 | ..... |

## STEEL CASTINGS—SHIPMENTS (Net Tons[1])

| | All Castings | | | Carbon | | | Alloy | | | Unfilled Orders[2] |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | For Sale | Railway Specialties | Total | For Sale | Railway Specialties | Total | For Sale | Railway Specialties | |
| 1954 | 1,184,096 | 880,158 | 135,581 | 802,(321 | 580,474 | 120,309 | 381,285 | 303,428 | 15,315 | ..... |
| 1955 | | | | | | | | | | |
| Aug. | 126,406 | 96,290 | 20,576 | 91,245 | 68,514 | 19,094 | 35,161 | 27,776 | 1,482 | 413,531 |
| 8 mo. | 968,926 | 740,853 | 142,863 | 679,159 | 507,755 | 131,580 | 293,141 | 228,098 | 11,283 | ..... |
| Sept. | 140,843 | 107,622 | 23,594 | 100,775 | 76,156 | 21,991 | 40,068 | 31,466 | 1,603 | 420,616 |
| Oct. | 145,674 | 110,409 | 23,745 | 105,345 | 79,235 | 22,375 | 40,329 | 31,831 | 1,370 | 418,063 |
| Nov. | 152,381 | 116,908 | 25,635 | 111,571 | 84,064 | 24,050 | 40,810 | 33,518 | 1,585 | 453,113 |
| Dec. | 158,982 | 122,201 | 29,003 | 116,872 | 88,894 | 26,919 | 42,110 | 33,307 | 2,084 | 475,335 |
| Total | 1,530,694 | 1,166,706 | 236,880 | 1,088,489 | 814,258 | 219,602 | 445,769 | 354,452 | 17,278 | ..... |
| 1956 | | | | | | | | | | |
| Jan. | 158,618 | 123,343 | 27,954 | 116,092 | 88,480 | 26,362 | 42,526 | 34,863 | 1,592 | 519,401 |
| Feb. | 165,398 | 128,598 | 30,833 | 123,279 | 94,998 | 29,112 | 42,119 | 33,600 | 1,721 | 567,330 |
| Mar. | 170,045 | 130,839 | 31,991 | 126,583 | 95,779 | 29,953 | 43,462 | 35,060 | 2,038 | 594,990 |
| Apr. | 163,708 | 125,015 | 27,475 | 121,723 | 91,332 | 25,302 | 41,985 | 33,683 | 2,173 | 600,242 |
| May | 178,227 | 142,025 | 35,949 | 134,919 | 107,575 | 33,695 | 43,308 | 34,450 | 2,254 | 608,275 |
| June | 164,661 | 129,117 | 31,296 | 122,483 | 95,621 | 28,801 | 42,178 | 33,526 | 2,495 | 597,103 |
| July | 117,984 | 96,350 | 19,833 | 88,971 | 72,837 | 18,545 | 29,013 | 23,513 | 1,288 | 611,233 |
| Aug. | 159,831 | 127,001 | 32,965 | 119,025 | 94,257 | 30,601 | 40,806 | 32,744 | 2,364 | 586,496 |
| 8 mo. | 1,278,472 | 1,002,318 | 238,296 | 953,075 | 740,879 | 222,371 | 325,397 | 261,439 | 15,925 | ..... |

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.


SHIPMENTS OF CASTINGS
( REPORTED BY BUREAU OF THE CENSUS )
THOUSANDS OF TONS
GRAY IRON
STEEL
MALLEABLE IRON
COPPER-BASE ALLOYS
ALUMINUM
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1954
1955
1956

## COKE PRODUCTION AND CONSUMPTION

(Net tons*)

| | Production | Consumption Total | Consumption By Foundries |
|---|---|---|---|
| 1954 | 59,526,723 | 59,139,159 | 2,479,926 |
| 1955 | | | |
| Aug. | 6,395,422 | 6,439,101 | 249,425 |
| 8 mo. | 48,711,611 | 49,426,173 | 2 039.669 |
| Sept. | 6,397,133 | 6,501,013 | 260,608 |
| Oct. | 6,630,609 | 6,813,118 | 283,818 |
| Nov. | 6,545,862 | 6,577,008 | 285,021 |
| Dec. | 6,865,032 | 6,949,073 | 284,936 |
| Total | 75,150,247 | 76,266,385 | 3,154,052 |
| 1956 | | | |
| Jan. | 6,914,836 | 6,182,704 | 275,660 |
| Feb. | 6,476,135 | 6,506,044 | 260,949 |
| Mar. | 6,896,593 | 6,861,698 | 267,414 |
| Apr. | 6,633,363 | 6,572,836 | 247,664 |
| May | 6,725,396 | 6,587,030 | 241,558 |
| June | 6,235,691 | 6,163,668 | 214,484 |
| July | 2,301,442 | 1,596,570 | 193,431 |
| Aug. | 5,614,830 | 5,278,612 | 225,978 |
| 8 mo. | 47,798,286 | 44,749,162 | 1,927,138 |

## INGOT BRASS AND BRONZE

(Shipments in net tons)

| | 1955 | 1956 |
|---|---|---|
| Jan. | 25,201 | 27,736 |
| Feb. | 25,349 | 24,949 |
| Mar. | 29,713 | 28,310 |
| Apr. | 27,641 | 25,808 |
| May | 23,708 | 23,437 |
| June | 23,141 | 18,842 |
| July | 18,513 | 17,364 |
| Aug. | 27,013 | 23,812 |
| Sept. | 26,349 | 20,929 |
| Oct. | 25,228 | ..... |
| Nov. | 25,102 | ..... |
| Dec. | 21,448 | ..... |
| Total for year | 298,406 | 166,466 |

Source: Defense Council of the Ingot Brass and Bronze Industry

## ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

| | Shipments Total | Shipments For Sale | Unfilled Orders[1] |
|---|---|---|---|
| 1954 | 520,501 | 322,845 | ..... |
| 1955 | | | |
| Aug. | 62,677 | 61,957 | 75,592 |
| 8 mo. | 501,486 | 331 153 | ..... |
| Sept. | 62,030 | 43,498 | 80,660 |
| Oct. | 71,689 | 46,581 | 85,489 |
| Nov. | 75,099 | 47,572 | 93,001 |
| Dec. | 70,950 | 47,547 | 86,120 |
| Total | 781,254 | 516,351 | ..... |
| 1956 | | | |
| Jan. | 68,050 | 43,750 | 83 234 |
| Feb. | 66,854 | 42,300 | 76,283 |
| Mar. | 65,760 | 42,806 | 73,025 |
| Apr. | 58,274 | 37,518 | 71,730 |
| May | 52,205 | 33,920 | 60,634 |
| June | 47,775 | 31,983 | 61,809 |
| July | 42,227 | 27,301 | 64,806 |
| Aug. | 52.321 | 33,281 | 73,411 |
| 8 mo. | 453,466 | 292,859 | ..... |

## INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only
(Net Orders Closed, New Equipment)

| | 1955 | 1956 |
|---|---|---|
| Jan. | 81.0 | 195.6 |
| Feb. | 90.4 | 169.0 |
| Mar. | 163.6 | 152.7 |
| Apr. | 178.6 | 135.2 |
| May | 145.7 | 207.0 |
| June | 186.8 | 156.7 |
| July | 213.4 | 110.3 |
| Aug. | 134.0 | 188.3 |
| Sept. | 156.7 | .... |
| Oct. | 108.6 | .... |
| Nov. | 154.4 | .... |
| Dec. | 183.9 | .... |

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent monthly average. This is a new base period. Source: Foundry Equipment Manufacturers Association.

## IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

| | All Scrap Total | By Types of Furnace — Cupola Total | Air Total | Electric Total |
|---|---|---|---|---|
| 1954 | 54,780,758 | 8,542,581 | 855,207 | 6,100,444 |
| 1955 | | | | |
| July | 5,447,130 | 730,735 | 81,216 | 623,623 |
| 7 mo. | 41,299,907 | 6,228,889 | 711,410 | 4,747,915 |
| Aug. | 5,913,031 | 868,644 | 101,607 | 765,343 |
| Sept. | 6,060,491 | 881,158 | 119.550 | 753,318 |
| Oct. | 6,443,349 | 944,685 | 113 411 | 820,642 |
| Nov. | 6,441,351 | 952,906 | 112.056 | 839,971 |
| Dec. | 6,496,796 | 910,675 | 115,436 | 830,404 |
| Total | 72,654,925 | 10,786,957 | 1,273,470 | 8,757,593 |
| 1956 | | | | |
| Jan. | 6,688,977 | 909,201 | 114,378 | 880,980 |
| Feb. | 6,345,421 | 892,373 | 116,418 | 833,661 |
| Mar. | 6,733,076 | 923,912 | 101 087 | 863,950 |
| Apr. | 6,490,680 | 802,233 | 96.514 | 842,216 |
| May | 6,491,567 | 855,007 | 104,485 | 899,967 |
| June | 5,994,989 | 776,299 | 87.525 | 831,456 |
| July | 1,986,613 | 621,064 | 56.071 | 399,441 |
| 7 mo. | 40,731,323 | 5,840,089 | 676,478 | 5,551,671 |

## PIG IRON PRODUCTION AND CONSUMPTION

| | Production** (Standard grades—net tons) Total | Foundry | Malleable | Basic | Low Phos. Intermediate Low Phos. & Bessemer | Consumption* (By type of furnace—gross tons) Total | Cupola | Air | Electric |
|---|---|---|---|---|---|---|---|---|---|
| 1954 | 58,113,924 | 2,241,436 | 2,798,646 | 47,485,047 | 5,587,465 | 52,373,541 | 4,364,418 | 215,158 | 155,258 |
| 1955 | | | | | | | | | |
| Sept. | 6.653,578 | 252,630 | 343.919 | 5.397.134 | 659.895 | 5.903.190 | 445.099 | 23.340 | 24.552 |
| 9 mo. | 56.621,443 | 2,107,379 | 2,888.322 | 45.796,732 | 5,839,010 | 49.646,967 | 3,941,980 | 191.208 | 182.959 |
| Oct. | 6.905,280 | 267,405 | 315.645 | 5,647,527 | 675.303 | 6.193,512 | 470,610 | 22.659 | 23,328 |
| Nov. | 6.636.649 | 241,727 | 353.713 | 5,404,584 | 636.625 | 5.973.223 | 469.485 | 22.621 | 18,148 |
| Dec. | 6.887.667 | 242.446 | 329.607 | 5.660,307 | 655,307 | 6.131.680 | 444.459 | 23.520 | 21,971 |
| Total | 77,114,073 | 2,858,957 | 3.884,971 | 62,570,394 | 7,799,751 | 68,944,698 | 5,326,534 | 260,008 | 246,406 |
| 1956 | | | | | | | | | |
| Jan. | 6,985,945 | 210,755 | 317,216 | 5,806,140 | 651,774 | 6,275.224 | 441.634 | 24.062 | 11,766 |
| Feb. | 6.539,199 | 229,440 | 370,208 | 5,350,650 | 588,901 | 5,871.824 | 430.792 | 24.307 | 13,010 |
| Mar. | 7,083,877 | 196,533 | 352.856 | 5,843,852 | 690,636 | 6.316.836 | 427.177 | 23.737 | 18,725 |
| Apr. | 6,860,833 | 210,319 | 333,660 | 5,623,647 | 693,207 | 6,077.074 | 413.537 | 22.757 | 17,179 |
| May | 6,873.102 | 232,375 | 329,750 | 5,625,067 | 685,910 | 6,064.632 | 413.494 | 24.074 | 28,596 |
| June | 6.387.608 | 213.769 | 331,871 | 5,227,488 | 614.480 | 5,642.004 | 379.803 | 22.039 | 23.460 |
| July-Aug. | 6.190,197 | 337,077 | 382.369 | 4.854.291 | 616.450 | 963.749 | 303,341 | 14,702 | 5,582 |
| Sept. | 6 873.064 | 236,809 | 316.590 | 5.636,000 | 683.665 | ..... | ..... | ..... | ..... |
| 9 mo. | 53,793,825 | 1,867,077 | 2,734,580 | 43.967,135 | 5,225,023 | ..... | ..... | ..... | ..... |

*Source: U. S. Dept. of Interior. Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

# Vault over your CASTING PROBLEMS with Smith L-O Core Oil

. . . and with the aid of the Smith Practical Foundry Serviceman in your area. He is glad at any time to collaborate with your staff in helping to overcome any core room problem that may confront you, and will recommend the proper grade of Smith L-O Core Oil that gives maximum results at lowest possible cost. Yes . . . look first to Smith L-O — the name that stands for a *service* as well as a *product.*

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- F. F. SHORTSLEEVE Elmira, New York
- PACIFIC GRAPHITE CO., INC. Los Angeles 22, California
- ST. LOUIS COKE & FOUNDRY SUPPLY CO. St. Louis, Missouri
- BRUCE-CONREAUX CO. INC. Indianapolis 7, Indiana
- WESTERN INDUSTRIAL SUPPLY CO. Portland 14, Oregon
- MALCOLM G. STEVENS Arlington, Massachusetts

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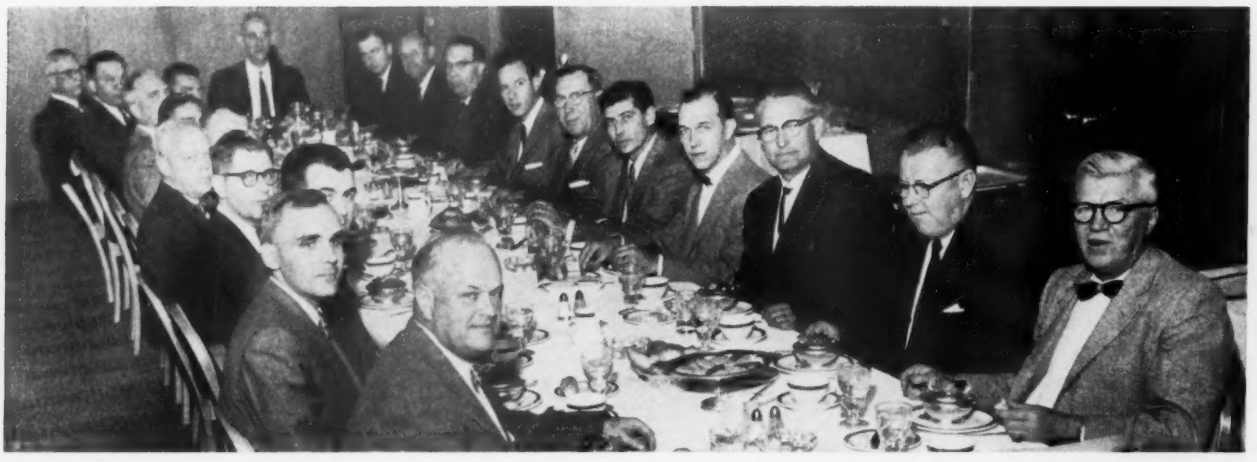
Circle 682 on Inquiry Card—Page 217

# News Views



**NFA MEETING:** The Administrative Council of the National Foundry Association is shown at a luncheon during the recent 58th annual meeting of the NFA in Detroit. The meeting program covered various phases of management-employee relations

**FLYING FOUNDRYMEN:** A new six-passenger airplane has been purchased by Empire Steel Castings Inc., Reading, Pa., to extend customer service and distribution. It replaces a single-engine aircraft

**STUDENT FOUNDRYMEN:** James H. Smith, general manager, Central Foundry Division, General Motors, was the principal speaker at the first annual sponsor senior banquet held by the GM Institute Foundrymen's Club, which has more than 100 student members. Left to right are Jerry Robertson, activities chairman; Don Olk, banquet chairman; Mr. Smith; Guy Cowing, president, GM Institute; and William Stuebe, secretary-treasurer

**SUCCESSFUL SAND SCHOOL:** Nearly 250 foundrymen from the United States and Canada attended the recent Dietert-Detroit Sand School. A high light of the meeting was a conducted tour of the foundry of Cadillac Motor Car Division, General Motors Corp. Clifford Hockman, foundry superintendent of the Cadillac foundry, is at left above

# FRICTION SAWING CUTS TRIMMING COSTS

## Removes Gates and Risers from Castings Faster and Cleaner Than Any Other Method

Like a hot knife through butter, DoALL friction saw bands slice through gates, risers and flash in seconds . . . up to 50% faster than any other method. (The finish is clean, reducing subsequent grinding costs.)

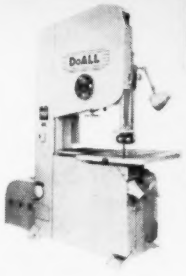
DoALL friction saw bands run at speeds up to 15,000 fpm. Frictional heat softens the metal ahead of the cut. The saw blade hogs this softened metal at an amazing rate.

The DoALL Zephyr band machine and the DoALL friction saw band are specifically built for high-speed friction sawing of ferrous metals. See their amazing cutting action. Call your local DoALL Sales-Service Store for a free demonstration or write:

THE DoALL COMPANY

Des Plaines, Illinois

FREE CATALOGS — Ask for new Zephyr and friction saw band catalogs—they lead the way to lower cost production!




**The DoALL Zephyr Band Machine**

36" throat depth, 20" work height, automatic brakes, power feeds (optional) and infinitely variable speed range to 15,000 fpm. Variable speed lets you contour saw, file and polish as well as friction saw—see this heavy-duty machine in action. Ask to have a free demonstration at your plant.

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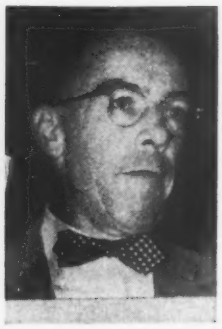
Available in: 500' coils or welded lengths to fit *any* band machine: ½", ¾" or 1" widths; and 10 or 14 pitch. Special heat treating provides longest flex life and fastest cutting. Try one of these long lasting blades today! Friction saw bands and other cutting tools stocked locally by friendly DoALL Sales-Service Stores in 38 cities—call yours today.

SB-52

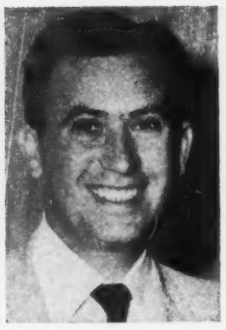
## Conference Speakers—

HARVEY BUFFUM

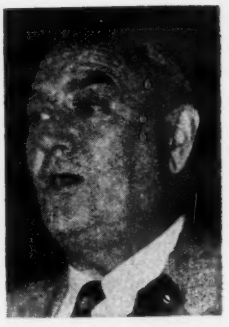


FRANK FRINK JR.

HAROLD HENDERSON



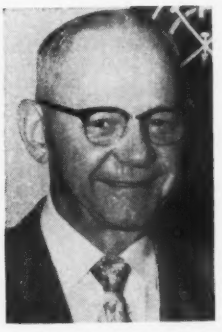
JONATHAN MARDEN



C. N. KEY

S. C. MASSARI

JOHN BERMINGHAM



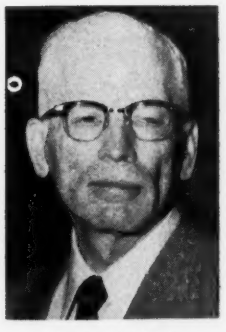
DOMINIC COCCIONE

W. A. SNYDER

CHARLES M. CARROLL

## Washington Chapter Host for

# Northwest Regional Conference



ED J. McAFEE

By NORMAN E. HALL
Electric Steel Foundry Co.
Portland, Oreg.

(With the co-operation of Harold Wolfer, Puget Sound Naval Shipyard; Vernon Rowe, Ballard Pattern & Brass Foundry Co.; Fred Young, A. E. Wilcox Co.; William Gibb, Atlas Foundry & Machine Works; Jack Peterson, Peterson Pattern Works)

FOUNDRYMEN and their wives, some 230 strong, met in Seattle, Oct. 19-20 for the seventh annual Northwest Regional Conference of AFS held at the Benjamin Franklin Hotel. The conference in general featured technical speakers drawn largely from the West Coast.

Opening the conference, John Bermingham, sales manager, Western Division, E. F. Houghton & Co., spoke on "Core Binders and Core Baking." He emphasized the notable quality improvement in foundry additives during the past ten years and discussed the main bonding agents commonly used today in baked cores —oils, resins and compounded oils.

Another point stressed in his talk was the fact that what may be a good procedure or mixture in one foundry does not necessarily work in another. The speaker also brought out the fact that no two core ovens will give equal results. Baking times, temperatures and ventilating methods differ in food baking and it is, therefore, understandable that core baking methods also should differ.

One of the conference highlights was a talk by Dominic Coccione, foundry superintendent, Washington Iron Works, who has just completed 49 years in the foundry industry. His subject was "Gating for Pressure Casting, and Economical Molding Practice."

During his service in the industry much progress has been made in the foundry, especially in sand practice and in metals and alloys, but Mr. Coccione observed that the greatest strides have taken place in casting design to meet the requirements of their end-use application.

He pointed out that early-day foundrymen accepted full responsibility for castings lost because of the mold, the core or the metal, with little consideration given to castability in designing the casting. Today those responsible for casting design share the responsibility with the foundrymen for good castings. The best gating and risering set-up will not produce good castings if the design is bad. Recalling his early experience with castings for steam-operated heavy logging machinery, the speaker referred to the tendency of early designers to incorporate too many heavy sections without regard to real need.

Mr. Coccione spoke of one experience where, after several unsuccessful attempts to get a pressure type liner casting, he forgot to cut the bottom gates. He decided to pour it through the risers and, as it turned

Schrader PILOT VALVES like the one above, and the one indicated by the red arrow, are used for remote control of air systems. Here, three are used to control the dip hopper air system. Schrader makes hundreds of air products to fit the needs of any operation. A few are indicated by red numbers, 1 through 7.

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*Circle 684 on Inquiry Card—Page 217*

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out, this liner was the first pressure type casting produced from the pattern. This experience led him to the development of a system of top pencil gating for liners, chests and many other pressure castings, and later to the development of a variation of this system for gating heavy steel castings weighing up to 40,000 lb.

His main purpose on all castings was to pour them as rapidly as possible to keep the scum and skin from rising in the casting. This produced a uniform temperature of metal through the mold, with a desirable temperature gradient from the bottom of the casting to the riser. This latter condition is especially enhanced by top pouring. Over the years Mr. Coccione has perfected this gating system, including the sloping of the pencil gates at 45° angle.

### Discusses Marketing Castings

S. C. Massari, technical director, AFS, addressed the group on the subject of, "Marketing Your Product." He touched on a number of the points brought out in his Hoyt Lecture at the 1956 AFS national convention.

At the luncheon on Friday, Frank Frink Jr., Washington Iron Works, outlined the high lights of the field trip through the Washington Iron Works plant in Seattle.

Principal luncheon speaker was Councilman Charles M. Carroll, city of Seattle, who welcomed the delegates and mentioned a number of the foundry products used by the city in its public works programs.

Toastmaster of the banquet Friday evening was Prof. Gilbert Schaller, University of Washington, who told of some of his interesting foundry visits during a trip to Europe this past summer. Main banquet speaker was C. N. Key, public information supervisor, Pacific Telephone & Telegraph Co., who spoke on "Sun and Sand." This was an interesting discussion and demonstration of the telephone company's research and experiments in the development of the solar battery. While it is possible to harness energy from the sun, the present cost is too high for practical acceptance. However, the main point is that the solar battery has been developed and with further research and study it is possible that this power source may be developed for commercial production in the near future.

The Saturday sessions opened with a showing of a film "Give Me Second Station," covering the story of the B-47 medium bomber. First speaker on the program was Harold E. Henderson, H. C. Macaulay Foundry Co., Berkeley, Calif., who addressed the group on "Sand Practice." Mr. Henderson pointed out the fact that while the foundry industry goes back thousands of years, it has only been in recent years that it has begun to disseminate information among its members.

Sand has been almost the last important item to receive much study. The industry is subjected to many profound results from technical sand tests; yet the tests made in our own plants are the ones peculiar to our own operation and are often the most important. He also stressed the importance of a local foundry committee working with local sand problems, the results of which can pay off with amazing results.

Prof. W. A. Snyder, University of Washington, speaking on the subject "Casting Design—Drawing Board to Product," pointed to the often-neglected outline which should be used by engineers in designing castings. Basic procedure consists of three main points: The part to be made, the material to be used, and the design of the part. These three points should be kept in mind when considering machinability, material cost, physical properties and standardization of the product.

Jonathan Marden, technical advisor, Eutectic Welding Alloys Corp. spoke on "New Developments in Foundry Welding." The speaker listed three common uses for welding in the foundry: (1) welding of broken parts, i.e., maintenance welding, (2) fabrication of foundry equipment, (3) casting repair.

### How To Insure Welds

To insure a proper weld, the welder should identify the material, properly prepare the joint to be welded, select proper welding rod and have manipulative skill. Mr. Marden discussed some of the modern advances in welding, including preparation of rods, cutting rods, and non-fusing low eutectic rods. The talk was followed by a film illustrating modern foundry methods and uses of welding rods.

"Impact of Aviation Developments on Industry" was the title of the Saturday luncheon talk presented by Harvey Buffum, Manufacturing Research Section, Boeing Airplane Co. The speaker discussed the high temperatures encountered in the development of airplanes traveling up to twice the speed of sound, and dealt principally with this problem as it affects the structure of the plane. Boeing is concentrating its efforts on the development and use of titanium alloys, and has 200 engineers working on the development and utilization of temperature resistant alloys.

The last speaker of the conference was Ed J. McAfee, master pattern-

maker, Puget Sound Naval Shipyard, whose subject was "Use of Epoxy Resins as a Pattern Material." He stated that while phenolic resins developed during World War II were originally thought to be suitable as pattern material, they have proved to be unstable mechanically. During the last 2½ years experiments with epoxy resins at the Puget Sound Naval Shipyard have shown them to be tough, stable and less expensive than most aluminum patterns. Manufacturing methods differ, but two which have proved most satisfactory are (1) casting in sections ⅜ in. or less and (2) layup employing glass fiber with resin saturation. In many cases old master patterns can be of value in making less expensive plastic patterns.

Technical sessions of the conference were well attended and attracted considerable interest. This is noteworthy inasmuch as many of the speakers were from the Pacific Northwest and as such had a more intimate knowledge of the common problems and interests of the foundrymen of the area.

Ladies attending the conference were invited for the Friday luncheon, Washington Iron Works field trip, the banquet, the dance on Saturday evening and were entertained at a special luncheon Saturday noon held in their honor at the Seattle Tennis Club, at which Lee Tillotson, decorator for Frederick & Nelson, was speaker.

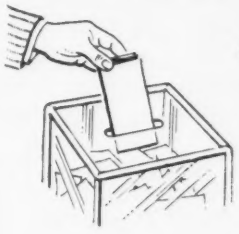
## Issues Molybdenum Research

Results of a five-year study of the metallurgy of molybdenum are summarized, evaluated and interpreted in a report of research for the Navy now made available to industry through the Office of Technical Services, U. S. Department of Commerce. Based on work conducted by Battelle Memorial Institute, Columbus, O., between 1949 and 1954, the final report contains an appraisal of the entire accumulation of data and their significance as applied to the three major phases of the investigation.

Phase 1 dealt with improvement of room-temperature ductility of molybdenum, especially in weldments. In phase 2 of the research, high-temperature mechanical properties of molybdenum and its alloys were measured. The third phase was a search for oxidation-resistant alloys of molybdenum.

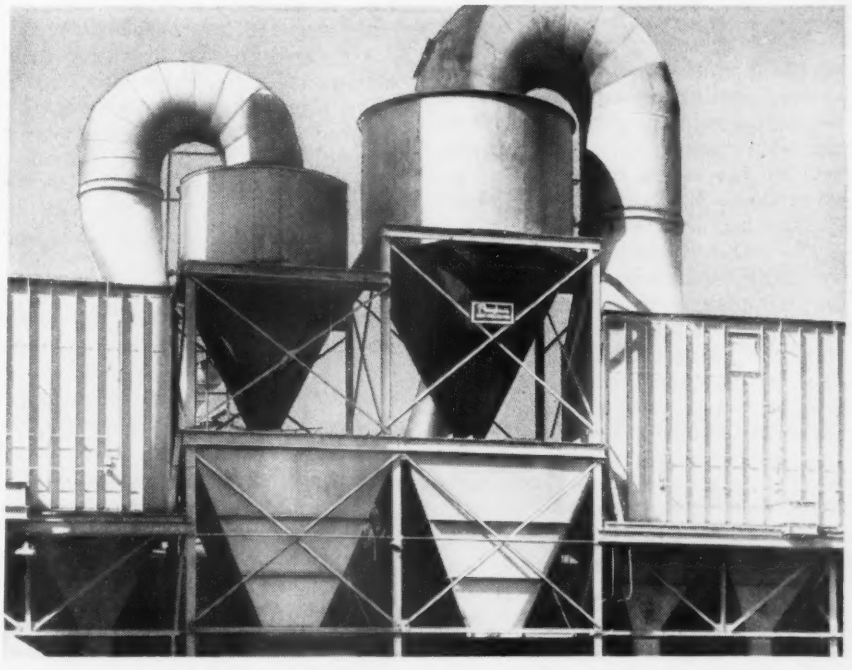
The 107-page summary—PB 111753, *A Metallurgical Study of Molybdenum*—may be ordered from OTS, U. S. Department of Commerce, Washington 25, D. C., at $2.75 per copy.


**Henry Chanin Corp. cast its ballot for**



**Pangborn Dust Control**

***. . . and voted itself over $10,000 a year***



The Henry Chanin Corp., East Point, Ga., is a processor of textile waste. To control the great quantities of dust released by the operations at this plant, the firm uses four Pangborn Dust Collectors.

Today Pangborn Dust Control has almost doubled production at Henry Chanin by eliminating daily downtime that had been required for machine repairs.

Working conditions and quality of product are both improved. And, thanks to Pangborn, maintenance and labor costs have been lowered by over $10,000 a year!

**Pangborn CONTROLS DUST**

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If you're interested in efficient, profitable plant operation, cast this "ballot" for additional information on Pangborn Dust Control. Send to **Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.**

# Foundry Group Meetings

**Philadelphia:** Ralph L. Lee, retired, public relations department, General Motors Corp., gave the William B. Coleman Lecture at the Oct. 12 meeting of the AFS chapter at the Engineers Club, Philadelphia. His subject was "The Feel of a Foundry."

The chapter is sponsoring a 14-week foundry educational course at the Murrell Dobbins Vocational and Technical School, Philadelphia. The course is recommended for persons requiring practical knowledge of how a sand casting is made. Scope of the course includes green sand molding with various types of patterns both on the bench and on the floor, coremaking and the melting, pouring and handling of metal.

The lectures will be supplemented by plant visitations, demonstrations by practical foundrymen and films on foundry subjects. Classes started on Nov. 19 and will meet from 7 to 10 p.m. for 14 weeks. Edwin A. Zeeb, Dodge Steel Co., and E. X. Enderlein, Enderlein Foundry, are co-chairmen of this project.—*E. C. Klank, Philadelphia Coke Co.*

**Central Ohio:** C. E. Fausel, Central Foundry Division, General Motors Corp., Danville, Ill., discussed "Preventive Maintenance" at the Oct. 8 meeting of the AFS chapter at the Seneca Hotel, Columbus, O. The speaker elaborated upon the highly mechanized systems in today's foundries and emphasized the need for special skills and systematic servicing and repair schedules to eliminate equipment breakdown. He indicated that high production is the function of preventive maintenance. — *Jose Acebo, Ohio Malleable Division, Dayton Malleable Iron Co.*

**Chicago:** Third presentation of Robert E. Kennedy scholarships featured the Nov. 5 meeting of the AFS chapter at the Chicago Bar Association. Among the nearly 270 present were 35 students enrolled in foundry and pattern courses at Navy Pier Branch, University of Illinois.

Chapter President Robert P. Schauss, Werner G. Smith Inc., presided at the general meeting. He presented a desk pen set to D. R. Jones, Illinois Clay Products Co., for his services as secretary during the past two years. Don G. Schmidt, H. Kramer & Co., chapter membership director, reported 71 new memberships, including 35 of student classification, to raise the chapter total to 886.

John A. Rassenfoss, American Steel Foundries, who was chapter president when the Kennedy scholarship fund was established in 1954, reported that the fund now approximates $7500 and will yield enough income for three $175 scholarships this year, compared with only one in previous years.

Mr. Rassenfoss presented the scholarships to Arnold Alek and Fred C. Bahr, sophomores at the Chicago Undergraduate Division, University of Illinois, Navy Pier, and Joseph J. Castronovo, former student at the Pier, who now is a junior on the Champaign, Ill., campus of the university.

Fred W. Trezise, associate dean of engineering at Navy Pier, spoke briefly in connection with the scholarship awards. Also attending the meeting were members of the Pier Advisory Board of the Foundry Educational Foundation and some trustees of that organization.

Three additional scholarships at the school were awarded by Roy W. Schroeder, associate professor of foundry and pattern laboratories, to Ronald T. Andretich, Roy G. Hlavacek and Algert Stanevick, on behalf of Kensington Steel Co. These students were employed by that company last summer and expect to return there next summer.

Chapter Vice President W. O. McFatridge, International Harvester Co., introduced participants in four roundtables. At the one sponsored jointly by the Gray Iron and Malleable Iron Divisions, H. E. Henderson, research metallurgist, Lynchburg Foundry Co., Lynchburg, Va., spoke on "Water-Cooled Cupolas."

The Steel Division was addressed by Leonard Bartosz, superintendent of steel foundry, National Malleable & Steel Castings Co., on "Gases in Steel Castings." Paul von Colditz, assistant works manager, Canadian Steel Foundries Ltd., Montreal, addressed the combined Pattern and Nonferrous Divisions on "Plastic Patterns and Coreboxes." The Maintenance Engineering Division heard R. W. Jones, director, legislative department, Illinois Manufacturers' Association, discuss "Will the New Chicago Zoning Laws Put You Out of Business?"

Four roundtables will provide the program for the Dec. 3 meeting as follows: Gray Iron and Pattern Divisions—"Casting Designs and Lower Casting Cost," by T. W. Schmidt, Giddings & Lewis Machine Co., Fond du Lac, Wis.; Malleable Iron Division—"Control to Eliminate Hot Tears" by R. H. Greenlee, Auto Specialties Mfg. Co., St. Joseph, Mich.; Steel Division—"Practical Testing and Selection of Refractories," by Richard N. Ames, United States Steel Corp., Chicago, and Nonferrous and Maintenance Engineering Divisions—"Noise, Vibration and Smoke," by W. O. Hanson, Allis-Chalmers Mfg. Co., LaCrosse, Wis.—*Erle F. Ross.*

**Lehigh Valley:** Lehigh Valley Foundrymen's Association held its first 1956-57 meeting on Oct. 9 at Lafayette College, Easton, Pa. Robert Latham, superintendent, Iron Foundry, Bethlehem Steel Co., chapter chairman, presided. Technical meeting was preceded by showing a film, "Ore in 54," which portrayed the opening of a new ore field in Labrador.

Lynford W. Butz, assistant to the superintendent of blast furnaces, Bethlehem Steel Co., spoke on "Manufacture of Pig Iron." He traced the manufacturing process from procurement of raw material through the blast furnace to final utilization of the various types of pig iron in the company's steel plant. Slides illustrated equipment used in various phases of the operation.—*Robert B. Fischer, Ingersoll-Rand Co.*

**Pittsburgh:** George H. Johnstone, president, Johnstone Foundries Inc., Grove City, Pa., spoke to about 110 members of the AFS chapter at its Oct. 15 meeting at Webster Hall Hotel, Pittsburgh.

Mr. Johnstone, who recently returned from a tour of foundries in Switzerland, Italy, France, Holland, England and Scotland, discussed European gray iron foundry practice. He showed slides to illustrate European cupola practice, molding, coremaking and cleaning.

In Europe, Mr. Johnstone found a high degree of mechanization, despite a lower wage rate. He discovered a great interest in better foundry practice through foundry associations in each country.

"Europeans maintain high individual skill and a large number of ap-

prentices in comparison with this country," Mr. Johnstone pointed out. "They try to keep their skills by developing good key personnel at the foreman level. In England, there is one apprentice to five journeymen. France and Italy have no restrictions on numbers of apprentices. Foundries there have large numbers of apprentices in their operations. They also employ women in light foundry work."

The speaker praised the housekeeping in European foundries. He also said those foundries use considerable ingenuity in developing some equipment.—*Robert M. Love.*

**St. Louis:** The AFS chapter in October heard Thomas P. Tierney, director of personnel relations, Organic Chemicals Division, Monsanto Chemical Co., speak on "Discovery and Growth of Key Personnel." E. G. Smythe, Tower Grove Foundry, served as chairman.

Mr. Tierney emphasized that development of key men is not the same as a training course, but is fundamentally guided self-development. The need for capable managers has increased, indicating the necessity for more carefully planned development programs. The nature of supervision has changed, according to the speaker, and the supervisor and manager must possess increased breadth of vision, better administrative and human relation skills.

He proposed five principles of personnel development: Let the man know what is expected of him; permit the man to perform, implying effective delegation of responsibility from his superior; keep the man informed of how well he is doing; provide assistance when and where necessary and provide suitable rewards and penalties for results obtained.—*Ralph Johnson, East St. Louis Castings Co.*

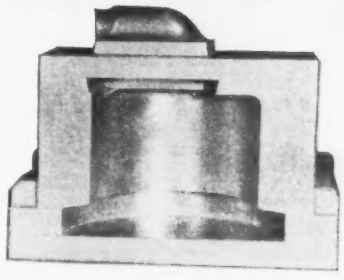
**Twin City:** "Foundry Manpower Needs" was the topic of a panel discussion by five Twin City educators at the Oct. 9 meeting of the AFS chapter held at the Covered Wagon Restaurant, Minneapolis. Seventy members attended. The panel was moderated by H. W. Teichroew, coordinator, trade and industrial education, St. Paul Vocational School. Other panelists were Robert M. Worthington, F. P. Bergup, Allen Cuthbert and Robert E. Larson.

The panel discussed the present program among Twin City vocational and high schools for training future foundrymen. They also outlined their personal opinions concerning what the AFS could do to promote a broader program of training in the foundry arts. It was agreed by the panel that there is need for greater emphasis on vocational and high school training in the foundry field.—*R. J. Mulligan, Archer-Daniels-Midland Co.*

**Northwestern Pennsylvania:** An organizational meeting of the AFS chapter was held at Amity Inn, Erie, Pa., on Sept. 10. The chapter met at Amity Inn on Oct. 22 and heard Lester B. Knight, president, Lester B. Knight & Associates, Chicago, discuss general problems relating to foundry mechanization.

Mr. Knight advised the group not to over-mechanize but to use only the machines and processes best fitted to the foundry's type of work. Constant and strict maintenance of equipment will save money, reduce downtime and increase production. Do not underbid a job just to get a contract. Analyze pattern layouts and place as many patterns as possible on wooden boards or metal


# METAL CORE BOX?



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- *Quick Drying Paint on, metallic Aluminum coating which may be sanded, filed or machined when dry.*
- *Not affected by synthetic Binders*
- *Hot sand does not stick to coating.*
- *Impervious to moisture and most solvents.*
- *Coats wax and leather fillets so liquid parting may be used.*
- *Coats wood patterns for longer life and slick draws.*

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**MABCO Aluminum Plastic**

**An excellent product for filling nicks and chips in wood or metal patterns and will fill holes in any type castings. MABCO Aluminum Plastic will not crack, chip or drop out. Makes a superior Metal Fillet material.**

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plates. Keep the patterns flexible. Standardize on uniform flasks. Incentive systems are successful only when properly supervised.—*Walter J. Yahn Jr., American Sterilizer Co.*

**Chesapeake:** Four plant visitations in addition to the regular technical meeting provided a full schedule for the AFS chapter at Waynesboro, Va., on Sept. 28. The DuPont acetate fibre plant, General Electric specialty control plant, Westinghouse air-conditioning plant and the Virginia Metalcrafters Foundry were the plants visited.

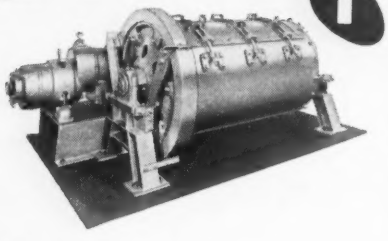
Eighty members and guests attended dinner at the General Wayne Hotel and heard a coffee talk by Charles Eckman, president and editor, *Waynesboro News - Virginian.* Technical speaker was H. H. Wilder, assistant manager-engineering sales, Vanadium Corp. of America, Detroit, on the subject "Practical Cupola Operation."

Mr. Wilder stressed the importance of clean metal of specified composition, spout temperature suitable to pour castings after normal foundry handling, minimum oxidation or reduction of spout metal, reproducibility of results with wide variance of raw materials and reasonable cost of conversion from solid to liquid. Coke sizes, and strict adherence to them, play an important role in producing a uniform heat. He said that the smaller the coke the larger the surface area of reactive carbon and the shorter the time needed for maximum temperature to be reached.

In closing, the speaker emphasized the importance of chill tests as a quick and inexpensive check which may save time and money in making the final product.—*Joseph A. Danko Sr., Danko Pattern Co.*


**3 steps to more production**

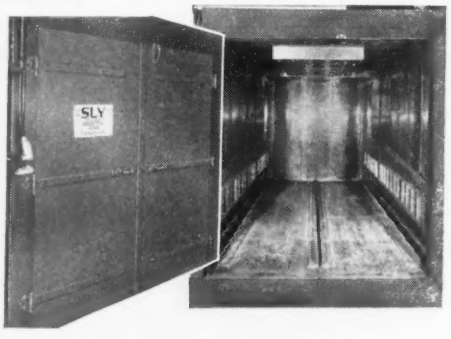
**1 SLY CLEANING MILLS**

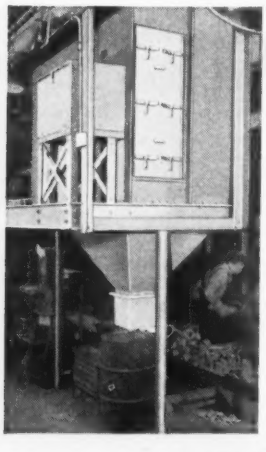


Join the return to less expensive cleaning of castings with these modern, quieter cleaning mills. Clean thoroughly — all castings at once — and save hours and hours of grinding time by eliminating fins as they clean. Your choice of over 120 sizes in batch mills and over 35 sizes in continuous mills, the most complete line of air blast mills, cabinets, blast rooms and other blast equipment in the industry.

**2 SLY CORE OVENS**

These ovens double production, even triple it in some cases, users say. Cores are better, stronger, less scrap. The efficient handling of heated air in Sly Convectioneered Ovens is the key to their efficiency.



**3 SLY DUST FILTERS**

These efficient dust filters are also morale-builders, production "pusher-uppers." By eliminating the dust and providing clean air, Sly Dust Filters increase personnel efficiency. A type and size for every need.

Tell us your problem and let us help you get more production.

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OFFICES IN PRINCIPAL CITIES


**San Antonio Section:** New officers were elected at the Sept. 24 meeting of the AFS section at the Alamo Iron Works, San Antonio, Tex. Plans were discussed for a casting clinic to be held in December, and a motion picture on coremaking was shown by courtesy of the Archer-Daniels-Midland Co.

Newly elected officers are Harold Judson, Kincaid-Osburn Electric Steel Co., chairman; G. G. Nelson, San Antonio Machine & Supply Co., vice chairman and Kenneth E. Kielty, Alamo Iron Works, secretary-treasurer.

Refreshments were served by courtesy of San Antonio Machine & Supply Co.—*K. E. Kielty, Alamo Iron Works.*

**Birmingham:** Over 100 members and guests attended the AFS chapter's Oct. 19 meeting at the Tutwiler Hotel, Birmingham. Herbert Stockham Jr. provided a coffee talk highlighting the past, present and future of his company, Stockham Valves & Fittings.

In recognition of his outstanding service as chairman of the membership committee, Henry Guthrie, Debardeleben Coal Corp., was presented an AFS certificate of merit.

The technical session centered around a talk, "Digging into Sand Fundamentals," presented by C. E. Wenninger, technical director, Hydro-Blast Corp., Chicago.—*J. R. Cardwell, Stockham Valves & Fittings.*

**Washington:** September meeting of the AFS chapter was held at the Poodle Dog Inn, Tacoma, Wash., with 45 members attending. Frank Brewster, director of research and development, Brumley-Donaldson Co., Los Angeles, spoke on "New Molding Developments and Their Place in West Coast Foundries."

Mr. Brewster suggested that it was time to change casting from a craft


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to a metallurgical process by increased use of instruments and control equipment. Sand control responsibility should be placed in one person. As there are many variables in new processes related to casting production, closer controls must be maintained. Since most sands are now compounded, engineering principles should be applied from the moment the sand enters the shop. Better quality castings are a must if foundries are to get an appreciable share of aircraft business.—*E. F. Riedle, Puget Sound Naval Shipyard.*

**Cleveland Nonferrous:** William Romanoff, vice president, H. Kramer & Co., Chicago, addressed Cleveland Chapter of the Non-Ferrous Founders' Society, Oct. 25, at the Cleveland Athletic Club. He discussed good brass and bronze foundry practice. Casting quality depends on using the correct metal and proper melting technique, pouring temperature, gating and sand formulations. The latter three are most important—accounting for 75 to 80 per cent of most casting difficulties.

Good technique involves melting fast in an oxidizing atmosphere and pouring fast with metal as cold as possible without getting misruns. Fracture tests should be made on castings poured at a series of temperatures to determine the best pouring temperature for producing sound castings with minimum porosity.

Records should be kept on foundry techniques and inspection results for all castings. Such historical data can be a guide to handling of future jobs of similar nature.

Current chapter officers recently elected are Charles Cairnie, Orrville Bronze & Aluminum Foundry, Orrville, O., chairman; Walter Larson, W. O. Larson Foundry Co., Grafton, O., vice chairman; Marvin Wolfe, Standard Brass Foundry Co., Cleveland, secretary, and David Kennedy, Gluntz Brass & Aluminum Foundry Co., Cleveland, treasurer.—*Robert H. Herrmann*

**Wisconsin:** Hotel Schroeder, Milwaukee, was the site of the Oct. 19 meeting of the AFS chapter and those present heard a panel discussion of "Practical Applications of the $CO_2$ Process." Walter W. Edens, Allis-Chalmers Mfg. Co., was moderator and W. H. Larrance, Riverside Foundry Co., Bettendorf, Iowa; Robert W. Eck, Eck Inc., Manitowoc Wis.; Orville Arendt, State Foundry & Machine Co., Cedar Grove, Wis., and Frank M. Steigerwald, National Malleable & Steel Castings Co., Cleveland, were the panel members.

Each member discussed the process as it is being used in his branch of the industry and it was evident that after using the process and learning some of its requirements it does offer another successful casting method. Mr. Steigerwald showed slides illustrating the savings in labor and expense by use of the process at his plant.—*John E. Hubel.*

**Ontario:** One hundred and fifty-two members and guests of the AFS chapter met at the Royal York Hotel, Toronto, Ont., on Oct. 12 and heard three talks. Frank Kellam, Electro Metallurgical Co., chapter chairman, presided and Lindsay Cooper, National Iron Co., served as technical chairman.

The talks were "Injection Carburizing and Desulphurizing of Gray Iron" by Dr. Richard Schneidewind, University of Michigan; "Pearlitic Malleable Iron" by A. Karpicke, Saginaw Malleable Iron Co., and "Nucleation in Castings" by Dr. Weingard, University of Toronto.—*J. K. Senior, Canadian General Electric Co. Ltd.*

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"Locking" out the destructive affects of metal oxides and slags for greatly increased service life is the feat performed by Walsh Graflok Plastic Ladle Lining.

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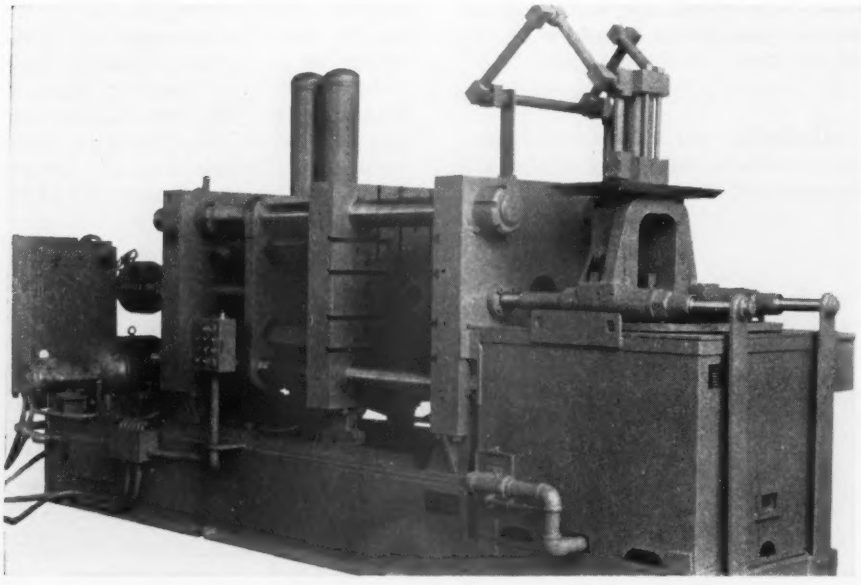
# New Equipment and Supplies



## Die Casting Machine

**features a four toggle linkage that locks under the tie bars**

B & T Machinery Co., Holland, Mich.—Zinc or aluminum die casting machine of 600-ton locking pressure features a four toggle linkage that locks directly under the tie bars. This linkage reportedly allows high locking pressures without strain to the machine because the four toggles are self-aligning. When off-center dies are operated the toggle pins are not subjected to a bending load. Hydraulic system has been designed for maximum speed, accessibility and efficiency with electrical and hydraulic interlocks for elimination of the open-shot menace. Platens measure 7 x 40 x 42 in. Tie bars are 5 in. OD hardened and ground 4140 steel alloy. Tie bar centers are 29 x 29 in. and space between bars is 24 x 24 in. Stroke is 13 in. Maximum die thickness is 30 in. with minimum die thickness of 12 in. Weight per shot, depending on the plunger diameter, is 9 lb for aluminum and 20 lb maximum for zinc.

For More Details Circle No. 401—Page 217

## Fire Extinguisher

**can be repressurized at any source of compressed air**

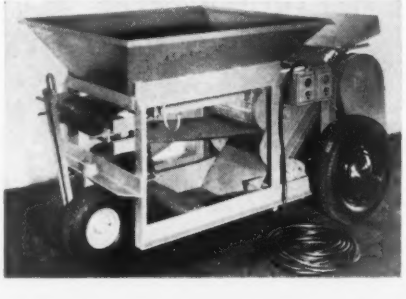
Ansul Chemical Co., Marinette, Wis.—Stored-pressure water fire extinguisher has 2½-gal capacity and will emit a water stream 35 or 40 ft. No bouncing or inverting is needed to activate the extinguisher. Water is released by operating a squeeze grip carrying handle. After use, the unit can be recharged by replacing the water and pressurizing to 100 psi at any source of compressed air. Three different shells are available—stainless steel, brass and chromium plated brass.

For More Details Circle No. 402—Page 217

## Sand Conditioning Unit

**is portable and provides magnetic sand separation**

Royer Foundry & Machine Co., 158 Pringle St., Kingston, Pa. — Magnetically cleaned sand, hopper feeding from three sides, sharp turning radius, compact size requiring minimum floor space and rugged over-all construction are features of new Magna-San unit. Company reports this is the first time it has provided magnetic sand separation to complement its Sand Separator and Blender in one portable unit designed for bucket loading by a front-end loader. Unit is 7 ft 6 in. long and 4 ft 6 in. wide, with a rated capacity of 45 tons per hr. Either portable or stationary models can be supplied. In operation, sand is loaded into the hopper by a front-end loader and carried by conveyor belt over a permanent magnetic pulley for removal of scrap and tramp iron. Sand is deposited immediately in Separator and Blender unit where it is aerated, mixed, broken up and discharged into a cool, fluffy pile ready for use.

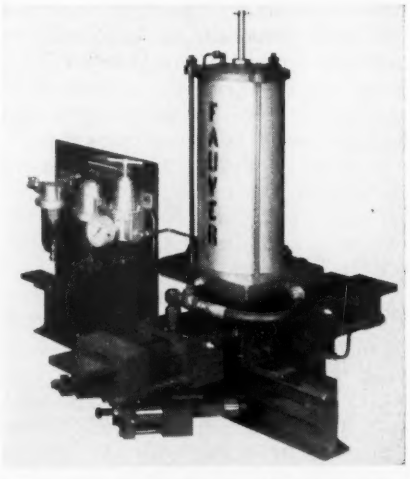


For More Details Circle No. 403—Page 217

## Conveyor Lubricators

**contain nondrip nozzles with automatic shutoff feature**

J. N. Fauver Co., 51 West Hancock Ave., Detroit 1, Mich.—Improved 700 series of conveyor lubricators consists of two types—model 702 which lubricates one side of the conveyor only and model 704 which lubricates both sides of a monorail conveyor. Three claimed improvements are improved air control panel, filter, regulator and lubricator, universal pickup (wheels of different manufacturers, on the same conveyor chain, can be handled equally well) and elimination of all drippage by use of a nozzle with automatic shutoff feature.



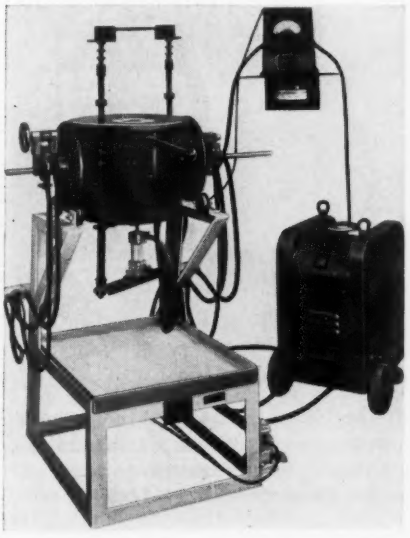

For More Details Circle No. 404—Page 217

## Indirect Arc Furnace

**uses alumina crucibles that are said to give slagfree pours**

British Industries Corp., International Machinery Division, 80 Shore Rd., Port Washington, N. Y.—Indirect 20-kva, 20-lb capacity arc furnace features high purity alumina crucibles to provide increased length of crucible life. Furnace is a standard pattern conversion type similar

For More Details on These Items
Use Reply Card—Page 217



in design to those used by precision investment casting foundries. It is powered at 95 v by a 20-kva transformer separate from the furnace. The transformer is mounted on casters and can be moved. Power control is obtained by electrode adjustment, but the general level is obtained by regulating the reactor control. Electrodes are water-cooled from ordinary water line pressure. Transformer can be connected to the following 60c, ac voltages—190-210, 220 to 240, 380 to 420 and 440 to 500.

For More Details Circle No. 405—Page 217

## Electric Fork Truck

**of 6000-lb capacity has low silhouette for safety**

Baker-Raulang Co., 1250 West 80th St., Cleveland, O. — Low-silhouette 6,000-lb electric fork truck needs 6 ft of clearance yet the operator's seat is 38 in. below the top of the mast. High stability, ease of maintenance and provisions for maximum operator comfort and convenience are features of the truck. The truck has three braking systems—hydraulic, self-energizing and self-equalizing. Maximum lift is 97 in. and turning radius is 99 in.

For More Details Circle No. 406—Page 217

## First Aid Station

**is small enough to mount on walls near hazardous areas**

General Scientific Equipment Co., Box 3038, Philadelphia 50, Pa.—First aid wall-mounting cabinet small enough to mount near hazardous areas is large enough to hold all necessary first aid items required for immediate first aid treatment. Cabinet's two doors are fitted with positive-action catches that cannot open as a result of vibration. Finished is durable, white, baked-on enamel, dimensions of the cabinet are 11 in. deep x 20 in. high x 24 in. wide.

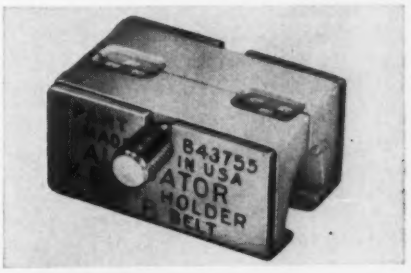
For More Details Circle No. 407—Page 217

## Scanning Recorders

**contain several improvements over company's earlier models**

Baldwin - Lima - Hamilton Corp., Electronics & Instrumentation Division, 806 Massachusetts Ave., Cambridge 39, Mass.—Company's 50-point automatic scanning recorders for SR-4 strain gages contain four improvements over earlier models: Either two-arm or four-arm strain gage bridges can be accommodated; a fourth range of 0-1000 microinches has been added to ranges of 0-2000, 0-5000 and 0-10,000 microinches; individual stress-strain curves can be plotted automatically for each channel and to conserve paper when less than 50 channels are being scanned, a chart skipping mechanism has been provided.

For More Details Circle No. 408—Page 217




## V-Belt Holder

**is for applying fasteners to open end V-belting**

Flexible Steel Lacing Co., 4607 Lexington St., Chicago 44, Ill.—Tool is for applying Alligator V-belt fasteners to open-end V-belting and is said to enable users of V-belts to keep a few feet of belting plus the tool on hand to make fast emergency repairs, thus reducing costly down-time. The tool or holder is made for B and C section V-belts.

For More Details Circle No. 409—Page 217

## All-Purpose Conveyor

**reportedly is maneuverable, compact, rugged and durable**

Hytrol Conveyor Co., Milwaukee 14, Wis.—Lightweight, all-purpose conveyor is reportedly compact, maneu-

## Shell Coreblower Features a Swinging Head

HOLLOW SHELL core blow and dump machine features a swinging head with a sand feed arrangement that delivers sand from main bin to self-feeder hopper and transfers sand to tube between blowing cycles. Thus, one side is curing cores while the other side is blowing them. Electrically controlled heater units assure desired wall thicknesses. A 1/16-in. shell can be cured in approximately 15 seconds with heat at 450°F.

Unit can be supplied with semi-automatic or automatic controls. Height of sand tube may vary to provide wide range of corebox capacities. Vise dimensions of machine illustrated are 10 in. high x 12 in. wide with a 4½-in. draw. Integral Calrod heaters, thermostat-controlled, give a range of up to 600°F. The unit operates on 800 to 100-psi air pressure.

Changing coreboxes reportedly is a simple clamp opening and closing operation. The machine is manufactured by Harrison Machine Co., Wesleyville, Erie, Pa.

For More Details Circle No. 434—Page 217

verable, rugged and durable. Conveyor bed is made of heavy-gage, heat treated aluminum and the adjustable tension belt has a reversible movement. Eight sizes are available,

ranging in length from 6 to 20 ft. A full complement of wheel, stand and feeder attachments can be provided.

For More Details Circle No. 410—Page 217

## Varistor Assembly

**is designed for use in protecting motors, generators, etc.**

General Electric Co., Metallurgical Products Dept., Detroit 32, Mich.—Thyrite discharge varistor assembly is designed for use in protecting motors, generators, lifting magnets, magnetic chucks, solenoids, relays, large coils, etc., against high inductive surges resulting from sudden interruption of inductive currents. Each varistor disk is 6 in. in diam and ⅜-in. thick, with a 1-in. central mounting table. Disks are bracket-mounted on a horizontal insulated bolt with a spring lock washer to provide contact pressure. Spacers are included to permit air circulation.

For More Details Circle No. 411—Page 217

## Ceramic Specialties

**are said to reduce costs and increase production**

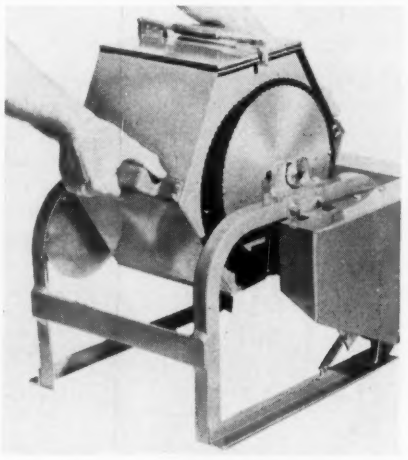
Du-Co Ceramics Co., Box 587, Butler 10, Pa.—Ceramic strainer cores, refractory tubing, skimmer cores, pin cores, pouring spouts and other specialties are said to reduce costs, increase production and provide cleaner castings. Made of high temperature fusion 3056 gasfree refractory material to close dimensional tolerances. A variety of tube sizes from 1/32 to 3 in. in diam, any length, can be supplied. Strainer cores from ½ to 4½ in. in diam are manufactured. Rectangular strainer cores also can be provided.

For More Details Circle No. 412—Page 217

## Small Parts Finishing

**is accomplished effectively and economically with new unit**

Chicago Wheel & Mfg. Co., 1101 West Monroe St., Chicago, Ill.—Handee Slide-Abrader is designed for deburring and finishing small parts for machine shop, die casting, screw machine and stamping departments. Machine is portable, has a three-speed drive and an automatic timer. Novaculite and other conventional types



of tumbling media and compounds can be used with the machine for the exact finish required.

For More Details Circle No. 413—Page 217

## Plastic Steel

**is for repairing broken machinery and metal parts**

Devcon Corp., Danvers, Mass. — Devcon, a combination of 80 per cent steel and 20 per cent plastic, is an adhesive for metals and can be used to bond steel, iron, bronze, brass, aluminum and lead to themselves, to each other or to many other materials including glass, porcelain, concrete and wood. It is used to fill large and small holes in castings, rebuild broken machinery, build up worn surfaces on machine tools, repair stripped threads and bearings and similar applications. Two hours after the addition of a hardening agent, the mixture becomes a rigid, tough, steel-like mass that, when hard, can be sawed, drilled, threaded or ground with regular metalworking tools. Two types are available: Devcon A is a putty that can be applied to a vertical surface and will not run or sag; Devcon B is a viscous liquid that can be poured.

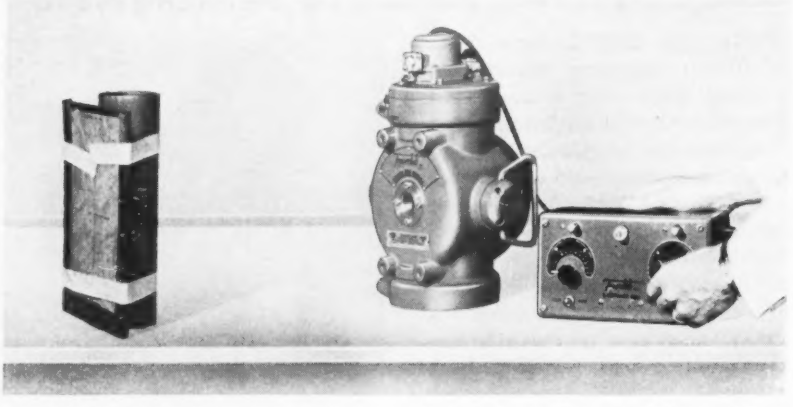
For More Details Circle No. 414—Page 217

## Measuring Instrument

**uses inaudible sound to measure thicknesses that can't be seen**

Magnaflux Corp., 7300 West Lawrence Ave., Chicago 31, Ill.—Ultrasonic measuring instrument uses sound you cannot hear to measure thicknesses you cannot see. It measures thickness from one side and shows readings by a "pip" on a TV-type tube face as rapidly as a crystal probe is touched to the test surface. It can be used on almost any sound-

## Radiographic Camera Uses Cesium or Iridium



GAMMA RAY beaming radiography camera, is designed to use Cesium 137 or Iridium 192 as the radioactive isotope. When turned on, the camera produces a conical beam of radiation 60 degrees wide, and the operator may work safely nearby, outside the beam. The operator can work all around the camera when it is turned off.

The camera easily accommodates 10 curies of Cesium 137 or 20 curies of Iridium 192. There are two models: E-37 is manually operated by controls on the camera body, and E-39 is operated by a remote control box which includes timers with a range of one minute to 12 hours. The camera is made by Tracerlab Inc., 130 High St., Boston, Mass.

For More Details Circle No. 435—Page 217

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### 441. Shell Molding Process

Monsanto Chemical Co., Plastics Division, Springfield 2, Ill.—Bulletin 1005 discusses the shell molding process, its historical background, its merits and equipment requirements as well as sand, binders and release agents. Some practical considerations of shell molding, limitations of the process and some typical gating systems also are covered.

### 442. Hopper Car Unloader

Barber-Greene Co., Aurora, Ill.—Bulletin illustrates and spotlights the operating features of Model 358 hopper car unloader engineered for unloading bulk materials such as sand, limestone, coal, coke, cinders, etc., from railroad cars.

### 443. Blower Coreboxes

Industrial Pattern Works, 2625 West Belmont Ave., Chicago 18, Ill.—Folder illustrates and describes method of casting aluminum alloy coreboxes and driers that assures the duplication of dimensions in the corebox cavity to within ± 0.003 in. within 12 in. Coreboxes are expendable in that manufacturer claims it is cheaper to replace than to repair them.

### 444. Zinc Die Casting

Henning Bros. & Smith Inc., 91-127 Scott Ave., Brooklyn 37, N. Y.—Booklet, "Die Casting with Zinc Alloys," presents a wealth of operating details on those requirements of alloys which affect the properties, both mechanical and physical, of the casting produced. Basics of gating, venting, use of overflow wells, gate runner design and injection pressures are touched upon.

### 445. Deoxidizing Briquets

Fire Brick Engineers Co., 2400 South 43rd St., Milwaukee 1, Wis.—General information on Ferrinox Briquets for controlled cupola deoxidation of gray iron is found in bulletin. Briquets are said to improve machinability, increase silicon recovery, improve fluidity, produce dense castings and increase tensile strength.

### 446. Blast Cleaning Abrasive

Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.—Information sheet presents advantages of Mallan'Steel, a blend of Malleabrasive and Tru-Steel, for abrasive blast cleaning jobs where loss or carry-out prevent full utilization of premium priced abrasives.

### 447. $CO_2$ Core Binders

Archer-Daniels-Midland Co., 2191 West 110th St., Cleveland 2, O.—Three grades of Adcosil $CO_2$ core binders are detailed in bulletin 107. Adcosil F, NF and SC are made for ferrous, nonferrous and super collapsibility applications, respectively.

### 448. Alloys Handbook

Federated Metals Division, American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.—Re-



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vised aluminum alloys casting handbook contains up-to-date and complete list of ASTM, SAE, Federal, Military, Navy and AMS specifications. Section on heat treating has been expanded and includes a reference table on suggested practices for heat treating cast aluminum alloys.

### 449. All-Purpose Grease

Penola Oil Co., 14300 McNichols Rd., West, Detroit 35, Mich.—New, versatile, multipurpose grease made from a high quality oil thickened with a complex soap is highlighted in descriptive literature. The grease, Nebula E.P. 1, is said to replace all the ordinary greases in a plant and can be used for all types of grease lubricated bearings and fittings.

### 450. Wet Blast Equipment

Cro-Plate Co., 747 Windsor St., Hartford, Conn.—Spiral-bound catalog contains descriptive material on manual, semiautomatic and automatic "Pressure Blast" wet-blast equipment. Illustrated case histories provide details on type of abrasives employed.

### 451. Air Cylinders

Miller Fluid Power Co., Division of Flick-Reedy Corp., 2040 North Hawthorne Ave., Melrose Park, Ill.—General information, mounting and engineering data on nonrotating, 200 psi air cylinders is found in bulletin A-105K.

### 452. Wire Rope Assemblies

Macwhyte Co., Kenosha, Wis.—Catalog 5601 provides dimensions, drawings, capacities, sizes of both terminals and wire rope for company's swaged wire rope assemblies. Assemblies consist of a length of preformed wire rope with a terminal attached to one or both ends.

### 453. Controlled Castings

Herbert A. Reece & Associates, Union Commerce Bldg., Cleveland 14, O.—Booklet contains engineering data on structure, tensile strength, compressive strength, resilience, fatigue strength and machinability of castings made with the Reecemelt Process—a licensed method of making iron that reportedly affords positive, absolute control of all properties of the metal.

### 454. Surface Thermometer

Royco Instruments, 789 Arthur St., Albany, Calif.—Form 2P756 describes a test instrument capable of a full scale indication on a one second surface contact. The contact type thermometer is illustrated and its specifications and features are included.

### 455. Drive Belts

Raybestos-Manhattan Inc., Manhattan Rubber Division, Passaic, N. J.—Folder 6638B details construction features and operational advantages of Poly-V Drive power transmission belts that reportedly combine the simplicity and strength of flat belts and the speed and grip of V-belts.

### 456. Machinists' Vises

Columbian Vise & Mfg. Co., 9023 Bessemer Ave., Cleveland 4, O.—Catalog LL-4103 details company's line of vises and accessories made from sledge-tested, guaranteed unbreakable malleable iron castings.

### 457. Bucket Carriers

Hapman Conveyors Inc., Division of Hapman - Dutton Co., Kalamazoo, Mich.—Application data, assembly diagrams, engineering features and operating advantages of pivoted bucket carriers are found in Bulletin HB-854. Units with speeds up to 60 fpm and capacities to over 100 tons per hr can be provided.

### 458. Fluorescent Lighting

Benjamin Electric Mfg. Co., Des Plaines, Ill.—Bulletin B contains descriptions, illustrations and lighting data on company's 394 industrial fluorescent lighting units. Section at back of bulletin contains a tabulation of coefficients of utilization for 22 of the most popular of the company units.

### 459. Rod Straightening

Hydro-Blast Corp., 10265 Franklin Ave., Franklin Park, Ill.—Folder presents application and engineering information on Rodmizer rod straightening machine that reportedly provides a fast way to straighten and classify core rods.

### 460. Air Systems

J. O. Ross Engineering Corp., 444 Madison Ave., New York 22, N. Y.—General information on company's recirculating air systems for core ovens and hot blast system for preheating air before delivery to the cupola are provided in bulletin 52.

### 461. Refractory Brick

Richard C. Remmey Sons Co., Hedley St. and Delaware River, Philadelphia 27, Pa.—Nineteen standard brands of refractory brick are high-



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lighted in bulletin RB-20. Classification, properties and applications of each are charted to simplify selection. Descriptions of other refractory products also are given.

### 462. Die Casting Machine

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, O.—Universal hydraulic die casting machine of 600 ton locking pressure for casting aluminum, brass and magnesium alloys (cold chamber) or zinc, lead and tin alloys (hot chamber) are featured in bulletin. General operating information and engineering data are included.

### 463. $CO_2$ Control Valves

Flex-Rite Valve & Mfg., Box 1855, Tulsa, Okla.—Information sheet describes positive pressure control valves for use in $CO_2$ sand hardening. Valve seats are made of tetrafluoroethylene resin and reportedly provide trouble-free $CO_2$ control service.

### 464. Air Grinders

Thor Power Tool Co., Aurora, Ill.—Bulletin JE-2022 provides capacities, specifications and general information on line of 5V grinders that, with accessory equipment, also can be used for sanding and wire brushing.

### 465. Roof Exhauster

Chicago Blower Corp., 9863 Pacific Ave., Franklin Park, Ill.—Roof Exhauster bulletin CH-101 explains the operational principles behind company's hi-velocity roof exhauster's automatic damper blades, exhaust capability and fusible link fire safety device.

### 466. Shell Mold Sands

Acme Resin Corp., 1401 Circle Ave., Forest Park, Ill.—Bulletin describes the benefits of using liquid-resin coated sands for making shell molds and cores by dump box, rollover or blowing methods. Either hot or cold mulling techniques can be used in coating the sands with liquid phenolic resin.

### 467. Refractory Gun

Eastern Clay Products Dept., International Minerals & Chemical Corp., 20 North Wacker Dr., Chicago 6, Ill.—Bulletin describes the Cupolinor 1500, a refractory gun for applying patching materials to cupolas.

### 468. Thermocouple Wire

Minneapolis-Honeywell Regulator Co., Industrial Division, Wayne & Windrim Aves., Philadelphia 44, Pa.—Specification S002-1 describes moisture resistant and flexible polyvinyl plastic insulated thermocouple extension wire, available in 14, 16 and 20-gage sizes for use with all types of Honeywell couples.

### 469. Grinding Specifications

Bay State Abrasive Products Co., Westboro, Mass.—Book, "Grinding Wheel Specifications for Tool and Die Steels," groups tool and die steels according to their grindability and resistance to abrasion. Wheel recommendations for various operations are given for each class.

### 470. X-Ray Microscope

General Electric Co., X-Ray Dept., Milwaukee 1, Wis.—Catalog describes x-ray microscope and also includes illustrative micrographs, historical background, fundamental theory of operation and basic technical details along with a list of suggested applications.

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### 471. Air Compressors

Binks Mfg. Co., 3122 West Carroll St., Chicago 12, Ill.—Basic selection considerations and engineering features of automotive, industrial and portable compressors are highlighted in catalog 820.

### 472. Investment Castings

Kolcast Industries Inc., 16601 Euclid Ave., Cleveland 12, O.—Bulletin covers production, metallurgical and research facilities for producing quality investment castings.

### 473. Castable Refractories

Laclede-Christy Co., Division of H. K. Porter Co., 2000 Hampton Ave., St. Louis 10, Mo.—Descriptions,



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product temperature range, selection data, construction features, physical characteristics, heat transfer chart and suggested applications for castable refractories are found in bulletin 42.

### 474. Conveying Equipment

Prab Conveyors Inc., 30121 Groesbeck Highway, Roseville, Mich.—Catalog 500 covers company's products including a totally enclosed bulk material handling conveyor system featuring a two-directional chain to convey in any direction and a welded tube precision piano hinge steel belt conveyor, fixture welded.

### 475. Motor Drives

Worthington Corp., Advertising and Sales Promotion Dept., Harrison 1, N. J.—Selection information, engineering features, remote control data and suggested applications for motor drives with positive pulley adjustment, ranging from ½ to 25 hp are provided in bulletin 1610-B1 P.

### 476. Vibration-Isolating Pads

MB Mfg. Co., 1060 State St., New Haven 11, Conn.—Bulletin 415B describes the characteristics and installation of Isomode neoprene vibration - isolating pads as machine mountings to control vibration, absorb impact and reduce noise.

### 477. Air Cylinders

S-P Mfg. Corp., 30201 Aurora Rd., Solon, O.—Catalog 110 covers 21 models of Series A nonrotating air cylinders with bore sizes from 1½ through 14 in. Designed to JIC standards, the cylinders have floating cushions, brass tubes to eliminate corrosion, removable bronze cartridges containing wiper and rod packing and cold rolled steel end plates.

### 478. Snagging Wheels

Electro Refractories & Abrasives Corp., 344 Delaware Ave., Buffalo 2, N. Y.—Bulletin GS-55 provides general information on custom resin and vitrified-bonded snagging wheels for use in steel, gray iron, malleable and nonferrous foundries.

### 479. Mounting Brackets

M & N Modern Hydraulic Press Co., Box 504, Clifton, N. J.—Bulletin 5185 describes and illustrates mounting brackets designed to permit fast coupling of hydraulic pumps to motors. Mounts may be used with any standard pump up to 10 hp.

### 480. Cleaning Compounds

Brulin & Co., 2939-45 Columbia Ave., Indianapolis 7, Ind.—Bulletin provides detailed information and applications of chemicals for industrial cleaning requirements. A variety of cleaners and degreasers are emphasized.

### 481. Ceramic Tubes

Claud S. Gordon Co., 3000 South Wallace St., Chicago 16, Ill.—Bulletin 1000-56 illustrates and describes the Serv-Rite line of ceramic protecting tubes, with data on various sizes of tubes available in different materials and prices.

### 482. Induction Melting News

Inductotherm Corp., Delanco, N. J.—first issue of *Inducto Metal Melting News* describes and pictures a 30 kw Inducto M-G furnace with console control for operating in either air or vacuum. The newsletter is written to cover products and procedures of the induction melting industry.

### 483. Dust Control

Aget Mfg. Co., Adrian, Mich.—Bulletin 636-3 presents engineering data, photographs, schematic drawings and application information to permit figuring your own dust collecting system, building your own hoods and selecting the right collector for the job.

## FOUNDRY Reprints

### 484. Training Needs

**Foundry Training Needs** highlights results of a study made by Labor Department officials working with representatives of the foundry industry. It indicates a growing need for service employees like patternmakers, maintenance mechanics and electricians.

### 485. Material Handling

**Application of Fork Trucks to Foundry Handling Problems** points out several areas where use of fork lift trucks can reduce man-hours, increase efficiency and cut costs of in-plant material handling.

### 486. Flasks

**How to Select and Maintain Flasks** considers the factors which go into determination of the proper size of flask. Valuable suggestions on flask maintenance also are offered.



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conductive material. A simple harmonic calculator is included with the unit for making measurements rapidly, up to 4 in., without calculations. Or, an accessory harmonic comparator can be used to further speed measuring.

For More Details Circle No. 415—Page 217

## Lever Lift Truck

**has 1500-lb capacity for moving loads on skids or bins**

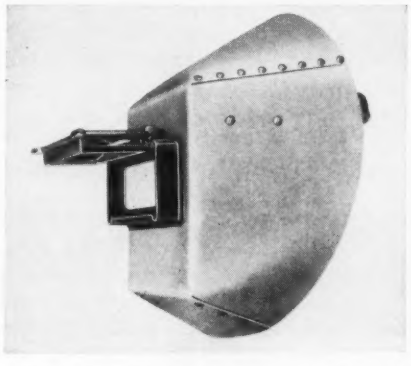
Thern Machine Co., 3760 West Fourth St., Winona, Minn.—Material handling device has a 1500-lb load capacity and is designed for moving heavy loads on skids or in properly designed bins within a plant or from a loading dock onto a truck or railroad car. Turning radius is 49½ in. Over-all width is 25 in. and over-all length is 43 in. Lifting mechanism assures the operator of almost effortless lifting as only 59 lb of effort are required to lift the capacity load of 1500 lb.

For More Details Circle No. 416—Page 217

## Welding Helmet

**is light weight and has a lift-front glass holder**

Fibre-Metal Products Co., Chester, Pa.—Narrow, deep design welding helmet with lift-front lens holder is engineered for easy access to work in close quarters. Designated No.



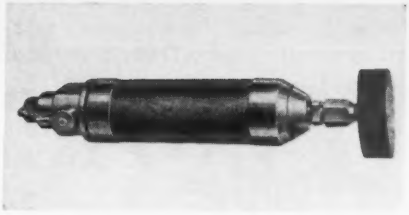
668-9, the helmet is light weight and equipped with a wide range ratchet adjustment to fit all head sizes. A padded sweatband is provided. All parts are replaceable. The helmet is formed from a flat sheet of fibre with lapped seams. No protrusions extend outside the helmet.

For More Details Circle No. 417—Page 217

## Pneumatic Hand Grinder

**is lightweight and easy to manipulate in close quarters**

Hudson Equipment Co., 515 Madison Ave., New York 22, N. Y.—Pneumatic hand grinder is 8½ in. long, has a 1½-in. grip and weighs 1½ lb. Its spindle speed is 15,000 rpm, actuated by a rotary-vane type air motor fully efficient at any air line pressure from 75 to 90 psi. Air consumption is 14 cfm. All load carrying ball bearings are designed and dimensioned to support heavy radial and end thrusts. Standard grinding wheels up to 1½ in. in diam can be used. Automatic lubrication in the air line is not required.



For More Details Circle No. 418—Page 217

## Fluorescent Lamp Fixture

**has been developed for use with company's new lamp**

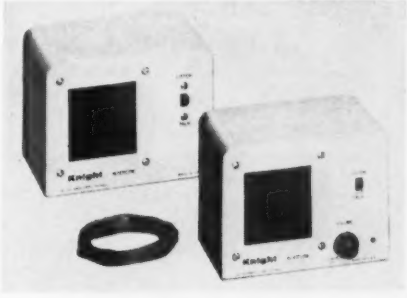
Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y. —A 4-ft fixture for company's VHO (very high output) fluorescent lamp has been developed. The lamp is said to provide 2½ times as much light as conventional models and is universal in application. Fixture is designed with a light green tint and includes a slotted reflector and upper component. The fixture reportedly uses the greater illumination of the VHO lamp to combine higher light output, color and good lighting principles or shielding in a fixture to provide controlled quality lighting for industry.

For More Details Circle No. 419—Page 217

## 2-Station Intercom Kit

**features simlified operation for use in plant or office**

Allied Radio Corp., Dept PR-787, 100 North Western Ave., Chicago 80, Ill.—Two-way intercom system consists of master station and remote station plus 50 ft of connecting cable.



Kit operates from 110-120 v, ac or dc, and features simplified operation as the master unit combines both volume control and "on-off" switch in one knob. Master station can communicate with the remote station regardless of the position of the switch on the latter. Because only the master station need be connected to

## Alloy Develops High Mechanical Properties

HIGH MECHANICAL properties and superior casting characteristics are said to be combined in a new high-strength aluminum bronze alloy to be produced for the first time in the United States by American Brake Shoe Co., New York, and Ampco Metal Inc., Milwaukee. These companies have joined with J. Stone & Co. Ltd., London, to form a new company, Superston Corp., which will introduce the alloy here. It will be known as Superston 40.

Superston 40 contains about 12 per cent manganese and is claimed to surpass other commercial bronze alloys in mechanical properties. It possesses high yield strength, toughness (Izod notched impact strength from 18 to 30 ft lb) and long fatigue life. It melts at 1814°F and can be forged, rolled or extruded.

First developed for marine propeller use, the patented alloy is, because of its mechanical properties and castability characteristics, finding new applications, both cast and wrought, according to American Brake Shoe Co. For sand castings, tests show that in the statically cast condition the alloy has these average test bar values: Tensile strength, 98,000 psi; yield strength, at 0.5 per cent elongation, 48,000 psi; elongation, 26 per cent in 2 in.; reduction in area, 28 per cent; and brinell, with 10-mm ball and 3000-kg load, 185.

The average test bar results for centrifugal castings are the following: Tensile strength, 105,000 psi; yield strength, at 0.5 per cent elongation, 50,000 psi; elongation, 28 per cent in 2 in.; reduction in area, 30 per cent; and brinell, with 10-mm ball and 3000-kg load, 190.

Information on the alloy can be obtained from American Brake Shoe Co., National Bearing Division, 4930 Manchester, St. Louis 10, Mo., or Ampco Metal Inc., 1745 South 38th St., Milwaukee 46, Wis.

For More Details Circle No. 436—Page 217

**DO YOU KNOW?**

**The ONLY complete line of**

**ADJUSTABLE**

**and**

**SELF ALIGNING**

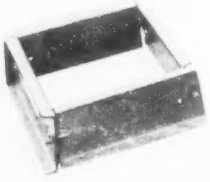
**Slip Jackets**

**is manufactured by**

**Products Engineering Co.**

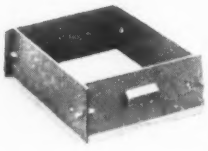
**Cape Girardeau, Mo.**

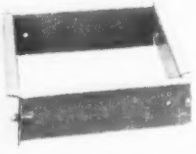
**Pats. Pend.**



**Type I**
3/16" Steel
**"Eliminate Shifts"**

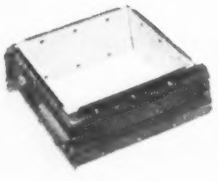
**Type II**
¼" Steel
**"Reduce Crushes"**

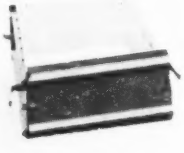




**Type III**
¼" Steel
**"Fewer Run-outs"**

**Type IV**
10 Gauge Steel
¼" Transite
**"Less Maintenance"**





**Type V**
3/16" Steel
½" Transite
**"Lower Costs"**

- The only jacket which is adjustable to fit different size molds—just drill more holes for more sizes.
- The jacket is self-aligning with controlled flexibility.
- All sides are replaceable and can be interchanged with others.
- Transite liners are easily replaced with stove bolts.
- Metal catching lugs have been eliminated so the jacket operates longer. Maintenance is easy as this is the only flexible jacket whose sides will lie flat.

*For additional information write—*

**Products Engineering Co.**

**Cape Girardeau, Mo.**

**Name** _____

**Company** _____

**Address** _____

**City-Zone-State** _____

*Circle 690 on Inquiry Card—Page 217*

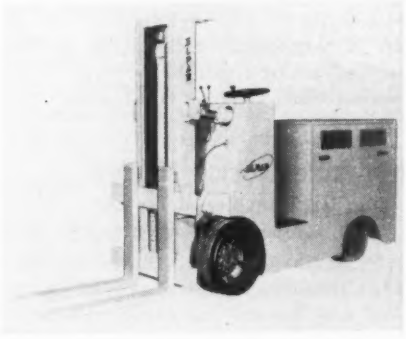

a power source, the remote station can be located at any convenient spot. Kit is listed under Allied's stock No. 83 Y 295.

For More Details Circle No. 420—Page 217

## Electric Fork Truck

**features front wheel drive and rear wheel steer**

Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, O.—Electric-powered, stand-up, center control fork



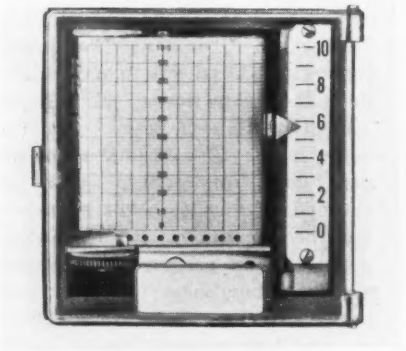
truck has a 10,000-lb capacity and features front wheel drive, rear wheel steer with a travel speed of 4.5 mph without load, 4 mph with full load. Other features include contactor control with automatic acceleration and four speeds forward and reverse.

For More Details Circle No. 421—Page 217

## Electronic Potentiometer

**provides a continuous record on a 3 in. strip chart**

Bristol Co., Waterbury 20, Conn.—Self-balancing electronic potentiometer uses standard components, is housed in a case 5 in. square and gives a continuous record on a 3-in. strip chart. The units are identical in appearance to the company's Metagraphic Pneumatic Recorder,




and accuracy and sensitivity are unchanged from the standard 12-in. unit. Small self-balancing instruments are furnished in indicating models also. Indicating and recording chassis are built for plug-in service and can be interchanged with each other. The instruments can be


**SHAMVA** the superior mullite refractory.

**HIGHEST** quality, pure alumina base.

**ASSURED** uniform thermal expansion. Excellent load capacity at high temperatures.

**MINIMUM** impurities — high fusion point and excellent resistance to heat shock.

**VOLUME** stable — calcined at 3250° F plus for maximum Mullite crystal development.

**ALL** these superior qualities result in lower operating costs.

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**No. 102 Brick & Special Shapes**

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REPRESENTATIVES IN: Buffalo Chicago Cleveland Detroit Lancaster, Ohio New York Philadelphia Pittsburgh San Francisco Seattle Los Angeles Denver Tulsa In Canada: A. P. Green Fire Brick Co., Ltd. Main Office: Toronto

*Circle 691 on Inquiry Card—Page 217*

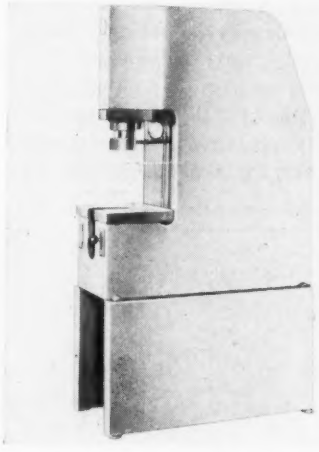
used to measure and indicate or record any variable which can be converted into an electrical quantity, such as temperature, pressure, flow, speed, pH, smoke density or resistance.

For More Details Circle No. 422—Page 217

## Hydraulic Presses

**of 7½ and 15-ton capacity can be used for many operations**

Northern Tool & Machine Co., 1545 North 31st Ave., Melrose Park, Ill. —Two models have been added to line of 10 and 20-ton hydraulic presses. The new presses — a 7½ and a 15-ton model — can be used for many operations. Slight movement of control lever starts ram in motion. Ram may be slowed or stopped at any point for work inspection or test alignment. A preset stop may be adjusted any distance from ¼-in. to the full stroke of 12 in. The 7½-ton model is available



with closing speed up to 265 ipm, pressing speed up to 240 ipm and return speed up to 400 ipm. The 15-ton model is available with closing speed up to 270 ipm, pressing speed up to 120 ipm and return speed up to 345 ipm.

For More Details Circle No. 423—Page 217

## Adjustment Sheaves

**permit quick and easy adjustment of V-belt drive sections**

Allis-Chalmers Mfg. Co., 1032 South 70th St., Milwaukee, Wis.— One and two-groove sheaves are for quick and easy speed adjustment of Texrope V-belt drives in A and B sections. Designed for low horsepower applications, the Magi-Key sheave is said to provide maximum design horsepower. In the sheave, keys transmit all rotational torque from shaft to hub and hub to disks. Set screws no longer bite into threads. The flexibly joined set screws and key give a positive lock between the movable disks and stationary


COKE WHEN YOU WANT IT

Only Semet-Solvay has 4 coke plants to serve you. There's one in your vicinity. For fast service, for dependable, uniform coke that means "Better Melting" specify Semet-Solvay Foundry Coke.

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For Better Melting

Circle 692 on Inquiry Card—Page 217

JOHNSTON

REVERBERATORY FURNACES!

★ Available in full range of sizes. 10,000 lb. furnace shown.
★ All parts exposed to flame or direct radiation are cast iron.
★ Automatic or manual controls.
★ Equipped with Johnston nozzle mixing burners. Also available with oil or combination burners.
★ Lined with top quality refractory brick.
★ Advanced design and quality workmanship throughout.

• Melting Furnaces
• Heating Torches
• Ladle Heaters
• Heat Treating Furnaces
• Burners, Blowers, Controllers

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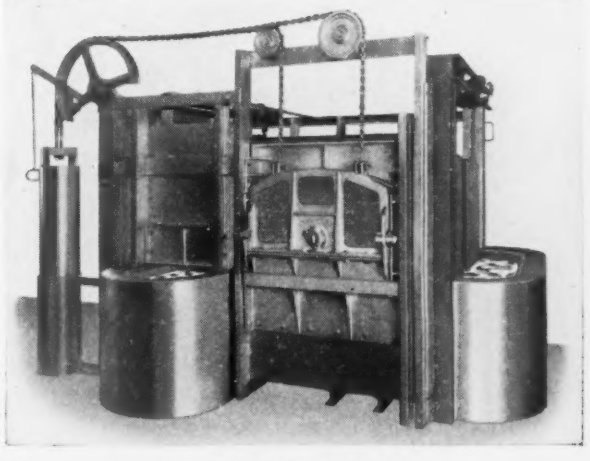
SAFETY THE JOHNSTON LINE DEPENDABILITY



JOHNSTON MANUFACTURING CO.
2825 EAST HENNEPIN AVE.
MINNEAPOLIS 13, MINN.
ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT

Circle 693 on Inquiry Card—Page 217

hub. Because the key and set screw always remain joined and in place, they cannot drop out during adjustment, nor can they move out of alignment.

For More Details Circle No. 424—Page 217

## Conveyor Pulley

**features completely sealed all-welded steel construction**

Rockwood Pulley Mfg. Co., 20 Crosby St., New York 13, N. Y.—Conveyor pulleys feature completely sealed all-welded construction. Steel plated discs are continuously welded to inside tube and the hubs to the plate disc. Pulleys are surface machined concentric with the bore. Normally they are obtained on even diameters and may be obtained in pipe size diameters.

For More Details Circle No. 425—Page 217

## Safety Spectacles

**are rugged, light in weight with color added for eye appeal**

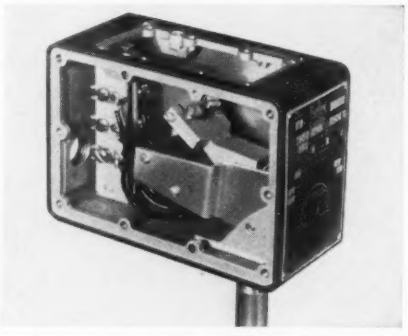
Welsh Mfg. Co., 15 Magnolia St., Providence, R. I.—Greater comfort, attractive styling and maximum vision are featured in plastic frame safety spectacles. Butyrate frame is rugged and light in weight with color added for eye appeal. Frames are supplied in copper, cordovan and crystal pink colors. Lenses are clear or green in heat treated glass or CR-39 plastic.

For More Details Circle No. 426—Page 217

## Temperature Controllers

**offer features and modifications for improved performance**

Burling Instrument Co., 16 River Rd., Chatham, N. J.—Series of differential expansion type temperature



controllers, models F-12, F-2C and F-3C, include on-off temperature control of heating operations, processes and equipment, safety alarms and cutouts on similar installations and combinations of control and alarm. Temperatures from sub-zero to 2000° F can be handled. Adjustable ranges as wide as 1200 degrees in an instrument are offered. Standard switch rating is 15 amp, 125-250 v, ac, but higher ratings can be provided.

For More Details Circle No. 427—Page 217

## Drum Handler

**permits one man to handle drums weighing up to 1000 lb**

Coolant Equipment Corp., Verona, Wis.—One man can handle drums weighing up to 1000 lb with Model 66 drum handler. Positive locking action clamps chime of all standard 30 and 55 gal drums with up to 2500 lb pressure for accident-free, upright transportation of liquids, small parts, chips and refuse in open or closed end drums or those with fully removable head. Load is always in balance and dangerous slipping or tipping is eliminated.

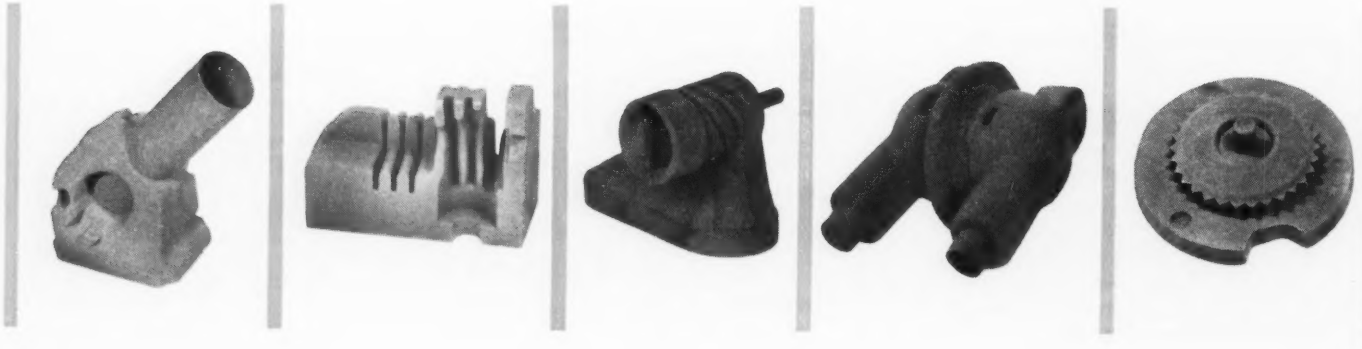
For More Details Circle No. 428—Page 217

## Machinery Roller

**is used for movement of heavy industrial equipment**

Industrial East Co., Express Roller Division, Box 561, Clifton, N. J.—Heavy-duty machinery roller is capable of moving objects up to 150

*Setting new uniform standards in cores and castings . .*



tons. The unit consists of two main components— series of moving rollers locked in an endless track and extending above and below a heavy steel frame. The frame which contains serrated edges grips and carries the work load being moved. Five ranges of sizes are available, from 2 to 150-ton capacities.

For More Details Circle No. 429—Page 217

## Lens Cleaning Tissues

**clean and fogproof lenses in one operation, with plain water**

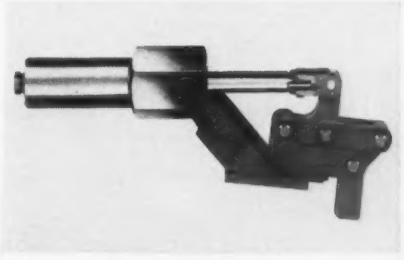
Carhoff Co., 11706 Kinsman Rd., Cleveland 20, O.—Chemically treated tissues will clean and fogproof lenses in one operation, with plain water. Lenses are wetted and wiped with the tissues; no other chemicals are necessary. Tissues also may be used dry for cleaning or polishing. Chemicals in the tissue are harmless to the skin and are nonabrasive.

For More Details Circle No. 430—Page 217

## Cylinder Clamps

**can do heavy duty work with no sacrifice in work space**

E & E Engineering Inc., 15023 Harper Ave., Detroit 24, Mich.—Clamping device is designed to be hooked into either air or hydraulic lines for operation. A clevis connects the cylinder to the clamp and allows the cylinder rod to travel in a straight line even when there are angular thrusts on the clamping bar. All components of the clamp are of solid bar stock and all pivot points are bushed with hardened bushings.



If requested, the clamp can be supplied with pivot points containing nonrotating fixture pins. All components are impervious to oil.

For More Details Circle No. 431—Page 217

## Tractor-Shovels

**feature increased capacity coupled with easy operation**

Frank G. Hough Co., 703 Seventh Ave., Libertyville, Ill.—Two new four-wheel-drive Payloader tractor-shovels are available for delivery. Models are HH with a payload capacity of 1¾ cu yds, 1½ cu yds struck and HU with a payload capacity of 1½ cu yds and 1 cu yd struck. A "no-stop" transmission permits all shifts in both forward and reverse to be made without slowing down. Fingertip directional control can be operated under full engine speed in any gear. Both transmission and torque-converter use standard SAE-10 HD oil.

For More Details Circle No. 432—Page 217

## Release Agent

**is for use in die casting aluminum, zinc and alloys**

National Aluminate Corp., 6209 West 66th Pl., Chicago 38, Ill.—Release agent designed for use in die casting of aluminum, zinc and alloys is odorless, smokeless, noncorrosive and nontoxic. Available in three viscosity-controlled grades, Nalco RA-1, RA-2 and RA-3, the agent is said to have demonstrated ability to deliver stainfree castings of a highly lustrous and smooth finish. The series may be applied either by spray, automatic injection or brushing. Viscosities can be altered to suit special requirements.

For More Details Circle No. 433—Page 217


SPO holo-core MACHINES

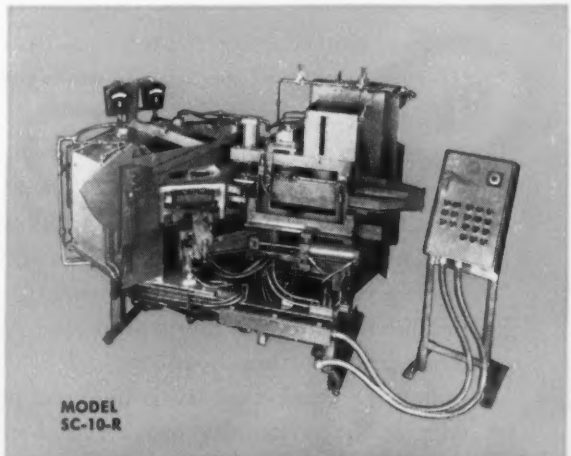
**A NEW CONCEPT** in casting quality and economy has developed because of *hollow cores.* Outstandingly superior to conventional cores, hollow cores assure extremely close tolerances . . . require no secondary operations . . . can be mass produced quickly and economically. They also eliminate venting problems, permit faster shake-out, are easier to handle.

**TO MEET THE NEED** for dependable hollow core equipment, SPO has developed a new line of "Holo-Core" machines. Three models are available. MODEL SC-10-D accommodates two core boxes up to 10x10x6". MODEL SC-20-D handles two boxes measuring 20x16x10". Operated by one man, these 2-station machines can be equipped with manual or semi-automatic controls. MODEL SC-10-R, a six-station rotary-type machine, features automatic control of all operations except finished core removal. *Its complete cycle is 15 seconds or less!*

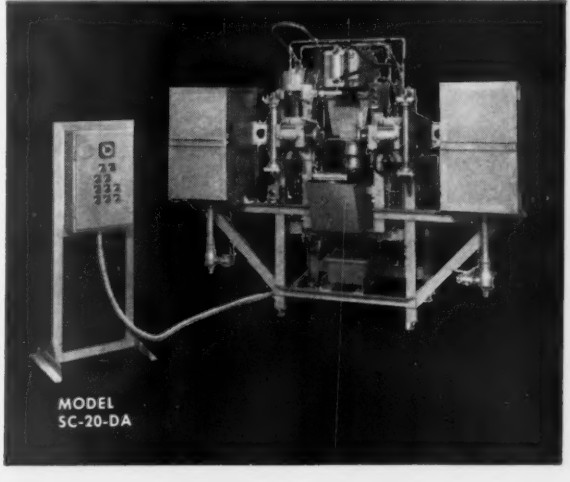
*For details and specifications, write for Bulletin SC-100 . . . or call DIamond 1-3666.*

SPO INCORPORATED

6449 Grand Division Avenue • Cleveland 25, Ohio



MODEL SC-10-R



MODEL SC-20-DA

# WHY you see MATHEWS CONVEYERS in so many MODERN FOUNDRIES . . .

Typical system of Mathews Roller Conveyer, with transfer cars, in modern foundry.

Most people, when they buy conveying systems, look for the equipment that's best for **their** plant—that is designed for **their** individual handling problem. Mathews' Engineers have been designing and building gravity and power conveyers and special conveying machinery for over fifty years, and a great amount of this equipment has been applied in foundries. Mathews' Engineers know foundry conveying problems. That's why so many foundry people have an extra measure of confidence in Mathews equipment—and why you see Mathews Conveyers in modern foundries everywhere.

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# MATHEWS


# *Meditations of a Sandman*

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.


## "Foundry Fables"

SOME six hundred years before Christ, there lived in ancient Samos, a Greek slave named Aesop. To him is credited the most effective use of the fable, a literary form of moral criticism which has lost none of its charm through the centuries.

In all probability Aesop never had an opportunity to observe the foundrymen of his day, or he surely would have produced a foundry fable or two worthy of preservation. Whether he would have personified lions, lambs, sand rats or jackasses as foundrymen is a moot question, but I'm sure that if a modern Aesop were to undertake the foundry assignment, his story might read something like this:

Once upon a time, in a western city, lived a poor foundryman who owned a one-man shop in which he performed all functions. He was molder, melter, general manager and everything else. His customers were few, his tonnage was small and his overhead low. He knew that he could never be rich, nor did he particularly want to be. The shop was his, free of debt. He and his little family were living as well as or better than they ever had lived before, and he was thoroughly enjoying "the glorious privilege of being independent."

Into his shop one day came a young friend — a molder with imagination and unlimited confidence, but no money. He explained to the older man that the world was just crying for castings in quantity and that by forming a partnership, they both could become very rich indeed. He had thought it all out carefully.

They could build a couple of additions onto the old shop, get a larger muller, a continuous oven, coreblowers, molding machines, roller conveyors, etc., etc., and really step up production.

The old man was sorely tempted, but he hesitated. "Where are we going to get the money for all this?"

The younger man smiled knowingly. "Why, we'll take in a partner who has money enough to get us started. Then I'll tie up a large local casting buyer with a proposition that he can't afford to refuse, and on the strength of his potential orders, we'll get all the credit we need for machinery and materials."

He talked at length of the possibilities, painting the picture in colors that dazzled the old man completely. The old man finally relented, and the partnership was formed.

The young man was true to his word. The building was enlarged, and facilities were expanded considerably. Foundry suppliers vied with each other to extend credit to this rising star on the foundry horizon. Soon there were fifty or more men on the payroll, and the casting production became the talk of the area.

Whether it was piecework or some other form of incentive system was not made public, but one thing was certain — never did molders and coremakers, or, in fact, everyone in the plant, work with such untiring speed and energy as they displayed in this new organization. Elsewhere in the area, both pace and production on comparable work suffered severely by comparison with the figures of this new shop.

There, men worked with a zest seldom seen. It almost appeared to be a contest in which today's record was to be broken tomorrow. Then the inevitable bottlenecks were created.

At first the coremakers could not keep up with the molders, so coreroom facilities had to be revamped, and more modern equipment was added. Then the cores came faster than the molds, and improvements were made on the molding lines. Finally the daily production reached a point where the cleaning department found itself snowed under. More and better cleaning equipment was ordered and installed, and this problem was obviated.

Soon, a new and totally different line of casting production was undertaken. This work called for expensive machines of a special design. It also called for knowhow that didn't come with the machines. Then quite suddenly everything began to go wrong. "The troubles came: and they came not single spies, but in battalions!" (My apologies to Shakespeare.)

Production faltered, casting defects increased, creditors became panicky, and ready cash was not available to meet those expenses which could not be satisfied with a promise. It was rumored that, over a long period, castings were being sold considerably below cost. The business finally reached its inglorious end. Bankruptcy and receivership followed in that order. Many people lost heavily in the experience, some of them irreparably. Probably several morals are to be derived from the tragedy here related, one of which would seem to be — *know your costs!*

He was a young man, a very young man, who had completed his apprenticeship as a molder and now looked upon the future unafraid and with unbounded enthusiasm as he faced a world which was to be "his apple."

After working as a journeyman for a few months, and thoroughly envying the big boss who sat behind the mahogany desk, he decided that he too could obtain independence by creating his own business.

He started with a small aluminum shop in his backyard, had cards and letterheads printed, purchased or fabricated some basic equipment, put in a ton of sand, and he was ready for business. Of course, he had to scale down his per-pound price a bit to attract customers, but in this he was successful. He soon found himself with more orders than a one-man shop could accommodate; so he hired a man to help him out.

At night, he studied every technical paper available which might have bearing on the problems he now faced. He studied costs, molding and melting procedure, gating and risering, chills (internal and external), sand control and all the rest of it. He improved both production and the quality of his castings. Day after day he experimented with promising methods and attractive innovations. Night after night he wrestled with technical theories.

He had started with less than the proverbial shoestring, yet in a brief ten years he acquired a bank balance of over $200,000 and could retire confidently to a life of ease and rewarding meditation. He was a living testimonial to the triumphant spirit of free enterprise. He had acquired a fortune through the application of an active intelligence, an indomitable will to succeed, long hours of hard work and the bequest of a rich uncle, who had willed him $198,000. *Moral: If you have a rich uncle, be kind to him!*

## Foundry Damaged by Fire

American Brass & Aluminum Foundry Ltd., 12520 123rd St., Edmonton, Alberta, Canada, sustained an estimated $10,000 damage from a fire on Sept. 26. Origin of the blaze, which occurred in the early morning, is unknown.

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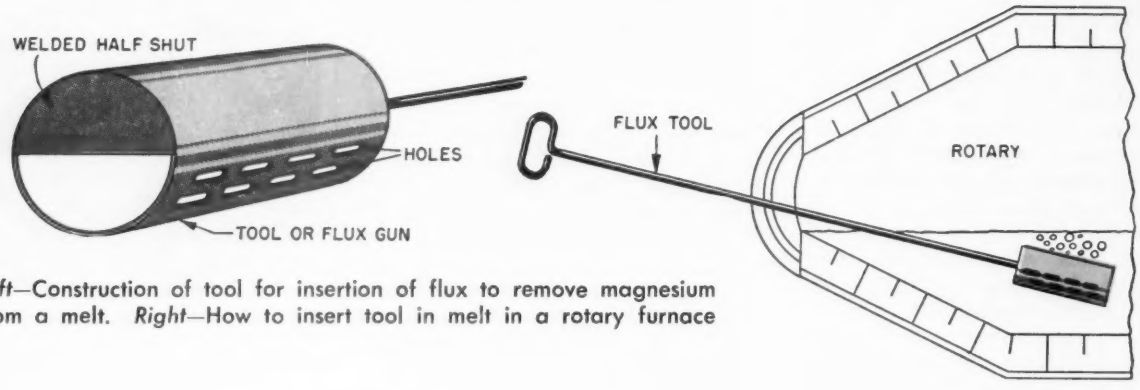
# Trouble Shooting

By C. W. AMMEN




*Left*—Construction of tool for insertion of flux to remove magnesium from a melt. *Right*—How to insert tool in melt in a rotary furnace

## Magnesium Removal from Aluminum

Dear Charlie:

Man, I sure got mixed up in an aluminum deal. Went into manufacturing a little product requiring aluminum of no special specs other than that it had to look and feel like aluminum. Cheapness and volume were the main considerations. I purchased a large amount of daisy-chain aluminum to melt in the little rotary, and things went O.K. for a while. For the most part, the stuff I was using was melted scrap from flying machines.

As time moved on, however, things went from good to bad to worse, and it became evident that the metal contained a large percentage of magnesium. Well, I purchased some flux to remove the magnesium, but so far it hasn't worked satisfactorily—or maybe our use of it hasn't been correct.

We also are having lots of arguments in regard to overheating the aluminum and causing what the foreman calls burnt metal. At what temperature would you consider a melt of aluminum burnt up or unfit for further use?

Sincerely,
Sam

---

Dear Sam:

Well, you will fool around with monkey metal. Rotary or not, when a product becomes too cheap in price to warrant the use of a good ingot, you have about as much chance of making out as a celluloid dog chasing an asbestos pussycat through the cupola at about 2 p.m. Monday. So have fun.

You can remove the magnesium if you are a stouthearted lad and pigheaded enough to stay with it. Once upon a time I saved 10 cents a pound by melting radiators on a job, and, let me tell you, that was the most expensive 10 cents I ever saved, so help me. Oh well, knowing you as I do, Sam, only time and money will answer your question on what you should do. So here goes.

One thing you should do is to consult your flux vendor as to the composition of the flux and how to use it. Most prepared aluminum fluxes are made up of calcium, sodium, potassium and magnesium chlorides, calcium fluoride and cryolite ($Na_3AlF_6$) mixed in various combinations. In FOUNDRY you will find listed several firms who manufacture well known, properly compounded fluxes which if used as per instructions will produce the desired results.

To reduce the magnesium content of aluminum melted in a small rotary, you must introduce a special flux under the surface of the molten aluminum. One such flux used by some operators consists, by weight, of one-third fluorspar, one-third sal ammoniac and one-third sodium silico fluoride. Now, here's the trick.

The flux must be introduced with a special tool, similar to a phosphorizer —a piece of 5 or 6-in. steel pipe with one end welded shut, the other welded half shut and holes cut into the bottom. This unit is welded to a suitable handle. You should have several such tools on hand to speed up the operation. To get the show on the road, mix up the flux and load, say, three of the tools. Next, bring the aluminum up to a minimum of 1500°F. It's important that the temperature be high enough to assure reaction. Insert one of the loaded guns under the surface of the melt and work it back and forth and around until the reaction stops. Then introduce the second tool, etc.

Like any reaction, this one is dependent on time and temperature. The higher the temperature, the quicker the reaction. Don't overlook the fact that working aluminum at 1500°F will put any free iron left on the bottom into solution. The amount of treatment necessary depends, it goes without saying, on the bath size and the amount of magnesium present.

Now, let's turn to the question of overheating aluminum and the so-called burning up. This is a question on which I have made it a practice to avoid a direct, head-on-the-block answer. It's been a point of much heated and strong argument since time began. I have read some reports with charts, figures and graphs supporting the theory that as long as the metal is allowed to cool to the proper pouring temperature and is properly degassed, it doesn't make any difference how hot a heat gets or how long it soaks. No harm is done, and good castings will result.

By the same token, I have read some strong stuff in the completely

opposite direction, also properly documented with graphs, charts, etc. I would try to avoid excessive metal temperatures, if only from the standpoint of economy. Should the heat reach too high a point, let her cool and jump on the side of those who say it's O.K. to superheat!

I do think that the somewhat overused alibi of burnt metal will go up in so much smoke if a careful, unbiased investigation is made and more careful control is exercised in pouring the metal into the mold at the correct temperature, regardless of how hot it might get in the furnace. When large castings requiring several ladles are poured at the same time, a scrap casting often is produced because of a difference of as little as 50 degrees between ladles.

If, for example, we pour a job with two ladles, one on each end, with one ladle at 1250°F and the other at 1300°F, the resulting casting may crack, draw or otherwise scrap out. If the 1300°F ladle were brought down to 1250°F or the 1250°F ladle were raised to 1300°F, chances of success would increase a hundredfold.

Thus, the most important requirement is that both or all ladles should be at the same temperature. About 95 per cent of all the aluminum castings scrapped because of so-called burnt metal merely are poured too hot. If a good pyrometer is used and the metal cooled down to the correct temperature for the particular job, scrap can be avoided. Oh well, so on into the night!

Brother, I have seen lots of guys take a pot out at 1550 plus, throw a chunk of metal in to cool it off, wait a bit and still pour too hot because the chilling operation may have dropped the temperature only 5 to 10 degrees. Since aluminum looks the same to the eye from 1000 to 1300°F, don't guess: Use the pyrometer. You are faced with the fact that given pouring temperatures, fluxes and methods advocated highly in some shops are condemned in others. Use your noodle and common sense, and good practice usually will win out in the long run.

Sincerely,
*Charlie*

## AMA Issues Publication Data

The 1956-57 edition of the *AMA Management Bookshelf,* a complete catalog of American Management Association publications, is available on a complimentary basis to interested managers. Write on organization stationary to Publication Service, American Management Association, 1515 Broadway, New York 36, N. Y.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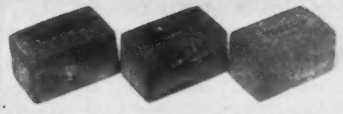
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# Technical Discussions at the INTERNATIONAL FOUNDRY CONGRESS

A WIDE variety of subjects was treated in the technical discussions presented at the recent International Foundry Congress in Dusseldorf, Germany. Summaries of various of these papers follow.

**Continuous Casting of Iron,** by A. Wittmoser, Gelsenkirchen, Germany—At the steel works at Gelsenkirchen, for the last five years, a research group has carried out trials on the continuous casting of cast iron. As a result, pressure pipes for water and gas, with and without flanges, now are cast in diameters of 400 to 1000 mm (15¾ to 39⅜ in.) and lengths up to 10 m (33 ft) by the process.

In the process, molten iron is poured continuously into a relatively short, water-cooled die or mold with a fixed mandrel in the center. As the iron solidifies the tube or pipe formed is drawn down slowly on a hydraulically operated, movable base or table until the desired length is obtained. By removing the mandrel solid cylindrical sections are produced. Cylinders about 39 in. OD with 5-in. walls and about 7 ft long also have been produced by continuous pouring.

**Construction and Operation of the Basic Cupola in Italy,** by Davide Masperi, Genoa, Italy—Basic refractory materials and their properties are reviewed and an Italian process for the production of stabilized dolomite and sintered tar dolomite is mentioned.

Experiments in Italy with the basic cupola, particularly in the foundry of the Ansaldo works, have given valuable experience. A comprehensive description is given of the charging of a 32-in. diam cupola and also of the complete furnace plant.

Several charge compositions for machine castings using a high percentage of steel scrap in the charge, also other charges without pig iron used for the production of steel works ingots and spheroidal graphite iron are described.

The results, obtained during two years' production of machine castings, are tabulated, quoting the chemical analysis and the physical tests.

A complete cost evaluation of the basic cupola process compared with the acid process shows comparable results in respect to the refractory lining, and the metal charge cost to be appreciably lower.

**Influence of Gas Scavenging on the Graphitization of Cast Iron,** by G. Blanc and N. Volianik, Paris, France—The authors studied the simple passage of various gases into alloyed and plain cast iron without introducing other ingredients into the bath. The gas was passed through quite vigorously, and was carried to the bottom of the iron melt by one or more graphite tubes with about ½-in. bore.

Samples cast against a cast iron mold show considerable diminution of the white marginal zone at the face of contact with the mold. This phenomenon occurs whichever of the gases may be used; with air or oxygen the passage must not be prolonged too much nor carried out at too high a temperature, or there is danger of a considerable decrease of the silicon content.

With gray cast iron this treatment improves the machinability and diminishes danger of occurrence of white zones in thin-walled castings.

In its application to a cast iron of low carbon and low silicon content—which without this treatment would be white or mottled—passage of gas will result in production of a sound gray cast iron which is easy to machine and shows a tensile strength of 49,640 to 59,580 psi without any additions of an alloying element.

**Effect of Gas Scavenging on the Magnesium Consumption in Production of Spheroidal Graphite Cast Iron,** by W. Patterson, Aachen, Germany—Experiments carried out at the Foundry Institute, Aachen,

Shown from left to right at the opening meeting are M. Guyer, Switzerland, Navarro Alcacer, Spain, and Harry W. Dietert, Harry W. Dietert Co., Detroit

American representatives at a meeting of the dictionary committee included, left to right, Daniel Krause, Gray Iron Research Institute, Columbus, Walter L. Seelbach, Superior Foundry Inc., Cleveland, and Vincent Delport, FOUNDRY

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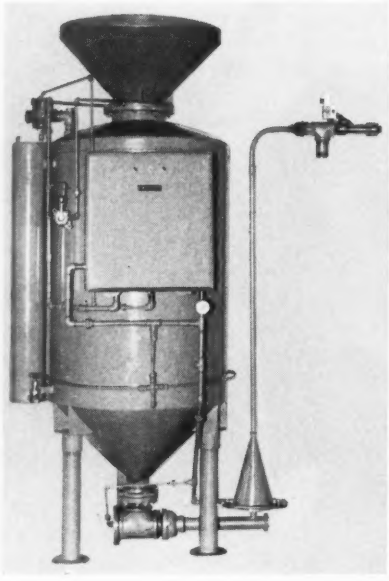

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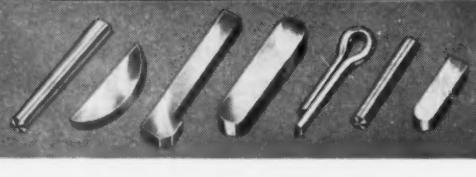


proved that magnesium additions can be considerably reduced by prior nitrogen scavenging of the melt. It was found possible to scavenge a melt of Norwegian Vantite-pig iron in a graphite electrode furnace with nitrogen and to obtain—after treatment with pure magnesium—spheroidal graphite cast iron. The tensile strength as cast was 84,000 psi with 5 per cent elongation.

**Oxide Patterns Appearing on the Surface of Molten Cast Iron,** by O. Madono, Tokio, Japan—Various pattern shapes of oxide films visible on the cooling surface of molten cast iron can be explained by reference to the $FeO\text{-}SiO_2$ phase diagram. There are four typical forms of this pattern, i.e. hexagonal structure, needle shape, bamboo-stalk type and ice-floe structure. The hexagonal formation is attributable to the coexistence of tridymite crystals and molten oxides; the needle shape as well as the bamboo-stalks type are ascribed to the formation of fayalite in the presence of molten oxides.

Silicon, carbon and nitrogen favor the selective oxidation of silicon by forming the silica-rich shapes, i.e. the hexagonal type. Manganese exercises a reverse influence and results in the development of FeO-MnO-rich oxide films, e.g. bamboo-stalk type.

A study of these characteristic patterns makes it possible to assess the chemical composition of the molten iron or to establish the nature of the gases present in large quantities.

**The Development of Internal Stresses Leading to the Cracking of Gray Iron Castings** by H. G. Angus and W. G. Tonks, Birmingham, England—This paper examines the previous information published, and shows that cracking stresses are mainly caused by temperature differences, do not commence to develop until the hottest member has cooled to a temperature of the order of 700 to 750°C. The stresses which develop above this temperature are opposite in direction to the final stresses existing in the cold casting. The plastic deformation of the hotter portions of the casting, which occurs above 700°, serves to insure that when all portions of the casting are cool enough to support stress, a substantially stress-free system exists in which different portions of the casting are at different temperatures. The final stresses develop from this point by differential contraction.

The paper summarizes the effect of metal composition, microstructure, methods of running, time and method of knock-out and other variables which may occur in the course of manufacture, upon the development of casting stresses.

**Elevated Temperature of Molding**

**Sands and its Correlation with Casting Defects** by Harry W. Dietert, Detroit—Cuts, washes and type B scabs are erosion defects and can be predicted and controlled on the basis of the hot compressive strength and hot deformation of the sand. They may be eliminated by increasing the hot compressive strength and the hot deformation through the use of clay or other high temperature bonding materials.

Rat-tails and buckles are expansion defects and may be predicted and controlled on the basis of the hot compressive strength at 1000°F and the confined expansion at 2500°F. If the hot strength is high and the expansion is relatively low, the sand may not produce these defects, but if both the hot compressive strength and the expansion are high the sand will have a definite tendency to form rat-tails and buckles. If the sand is low in both hot strength and expansion, it will be free of rat-tails and buckles.

Type A scabs are also expansion defects and, like rat-tails and buckles, are caused by mold or core surface instability. By plotting expansion and hot deformation against temperature, one may derive three scab control factors. The higher the values of these three factors, the greater the susceptibility of the sand to type A scab defects.

Rat-tails, buckles and type A scabs may be reduced or eliminated through the use of cushioning agents, such as wood flour, cereal, grain hulls, pitch or seacoal.

A more recent test shows good correlation with rat-tails and type A scabs. The test procedure consists of shock-heating a specimen from room temperature to 1800°F while applying enough load to maintain the specimen at a constant length. This determines the load necessary to overcome the expansion of a sand and the value reported is the average load necessary to maintain constant length during the first five minutes of test. The greater the expansion load, the greater the tendency to produce rat-tails, buckles and type A scab defects.

**Studies on the Evaluation of Molding Sands,** by H. Jungbluth, Karlsruhe, Germany—W. Reitmeister had as early as 1927 directed attention to the possibility of evaluating molding sands, based on "specific gravity" (meaning the weight of unit of volume), the "specific mold volume" of the rammed sand and the "specific bulk-volume" of the loose, uncompressed sand.

This paper shows that Reitmeister's curves which connect "specific mold volume" with moisture content of the sand can equally be established by the DIN-method. This has been done with three molding sands.


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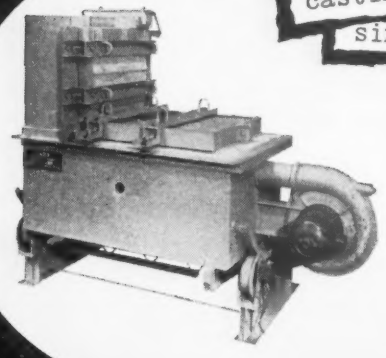

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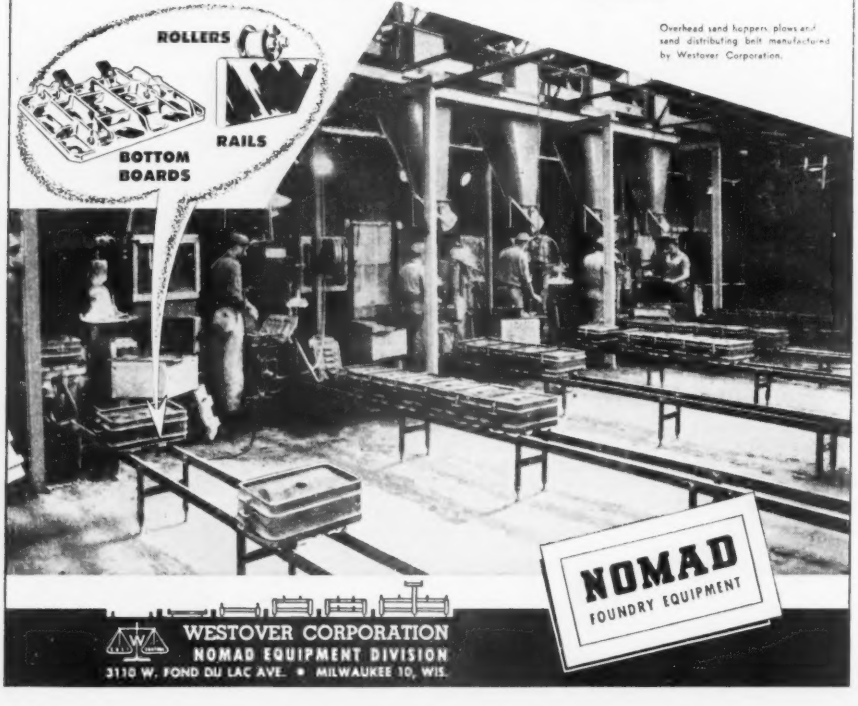


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The same samples were also tested for gas permeability and compressive strength.

Reitmeister concluded from his curves, that two types of molding sand compression curves occur, which differ by their swelling capacity. He also thought that a close connection existed between the mold volume of the dry sand and the gas permeability and that has been confirmed in general, despite a few exceptions.

The use of triangle co-ordinates for the presentation of the results of molding sand investigations, as suggested by W. Goetz, has distinct advantages. By using the "sand triangle," one can also immediately incorporate the two Reitmeister compression types of molding sand. It can further be seen from the sand triangle that it is more feasible to expect a connection between the weight of unit volume of the dry sand and the gas permeability, than between the weight of unit volume of the moisture containing sand and the gas permeability.

But it was found when investigating the three sands that the connections are not as close as Reitmeister thought they were.

**Behaviour of Green Molding Sands During Shock Heating in Connection With the Occurrence of Surface Defects,** by H. G. Levelink, Rijswijk, Holland—A study has been made of the expansion-phenomena at the surface of test-pieces of green sand, exposed to shock heating in connection with the occurrence of casting defects as expansion scabs, buckles and rattails.

Comparative measurements have been carried out on a few molding sands. The expansion force was measured on a testpiece fairly evenly heated through the whole section from room temperature up to a temperature above that of the $\beta$—$\alpha$ inversion of the silica sand.

The following properties of the molding sands—having an influence upon the peel formation in general are apparent:

1. The cohesion of the sand in a wet layer which is formed between the dried surface-layer and the moist sand behind. This property was strongly influenced by the type of clay used.

2. The expansion force, developed by the molding sands as a result of an impeded expansion. On this property additions as woodflour, pitch and coal dust have a marked influence.

**Some Aspects of Shell Molding Theory,** by Dr. B. H. C. Waters and A. Braybrook, Sheffield, England—Factors influencing the cold strength of a shell mold are first explored, and an estimate is made of the influence of the type of sand and resin

used. The hot strength of a shell is also considered, and experimental work with a hot bend test is described. The results are linked with data available for the strength of a metal casting skin, and from the two sets of data an estimate is made of the theoretical metallostatic head which shell castings can resist.

The incidence of segregation in a resin-sand mix both in the mix itself and on the pattern plate is investigated, and its effects are traced. Gas defects in a shell casting are affected by shell permeability, so the effect of this factor is considered. The gas content of a shell itself is also considered, and its variation with resin content is determined experimentally.

Bearing in mind the factors previously examined, the surface finish of shell molded castings is discussed. This is considered to be influenced by the sand grain size and the behavior of the shell mold gas, as well as by the particular metal cast.

Shell closing is reviewed, and theoretical work done on shell closing methods and materials is related to practical conditions. The running and feeding techniques are considered, and their application discussed.

**Theoretical and Practical Problems of Bentonite Research,** by H.-E. Schwiete, Aachen, Germany—The paper points out that x-ray analysis permits the estimation of accessories in bentonites, quantitatively and with high accuracy. In addition—within a slightly wider range of error—approximate values for the clay mineral content can also be given.

The thermochemical methods discussed later, especially the "dynamic differential calorimetry" (DDC) can only be used to a limited extent for quantitative estimations. With their aid, however, as well as with x-ray analysis, it is possible to evaluate the homogeneity of various bentonite supplies. This is demonstrated by a few practical examples.

The behavior of montmorillonite on heating (up to 1200° C), based on x-ray observations, is described, and the newly formed phases found by this method are pointed out.

Distinct differences exist between the behavior of natural sodium and calcium bentonites, and the activated sodium bentonites respectively.

**Green Sand Molding of Large Steel Castings,** by C. W. Briggs, Cleveland—A study of 33 foundries in the United States and Canada using green sand molding to produce steel castings of 8000 to 84,000 pounds with section sizes from 2 to 36 inches, has revealed valuable information on the techniques and difficulties of the process.

Mulling time varies from 1.5 to


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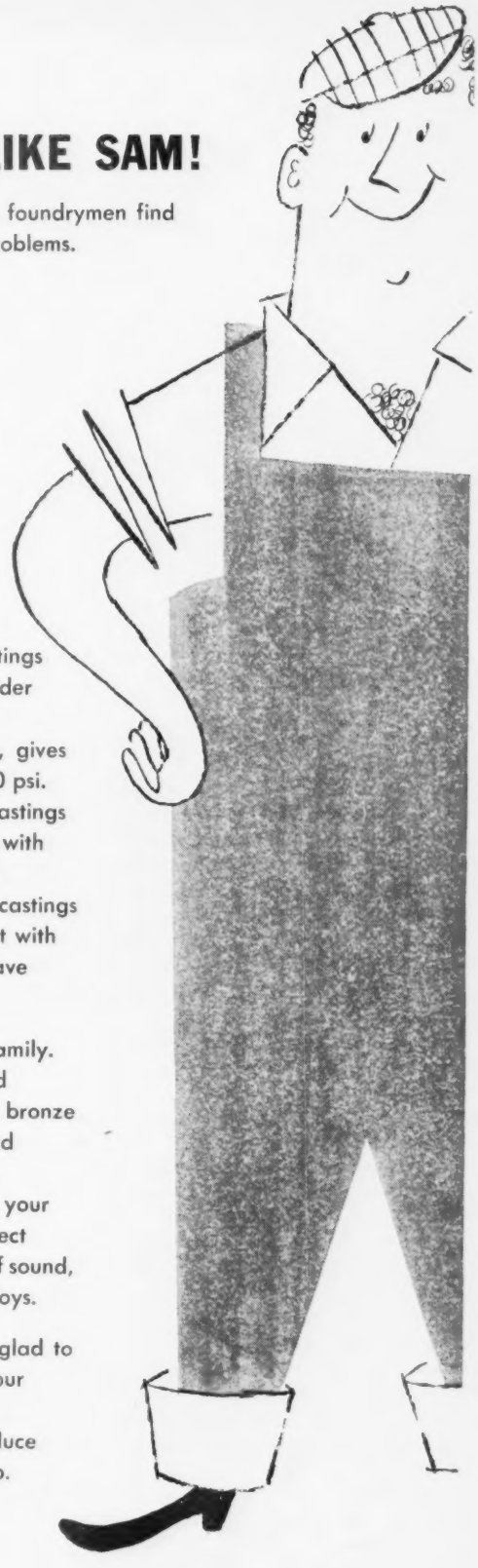

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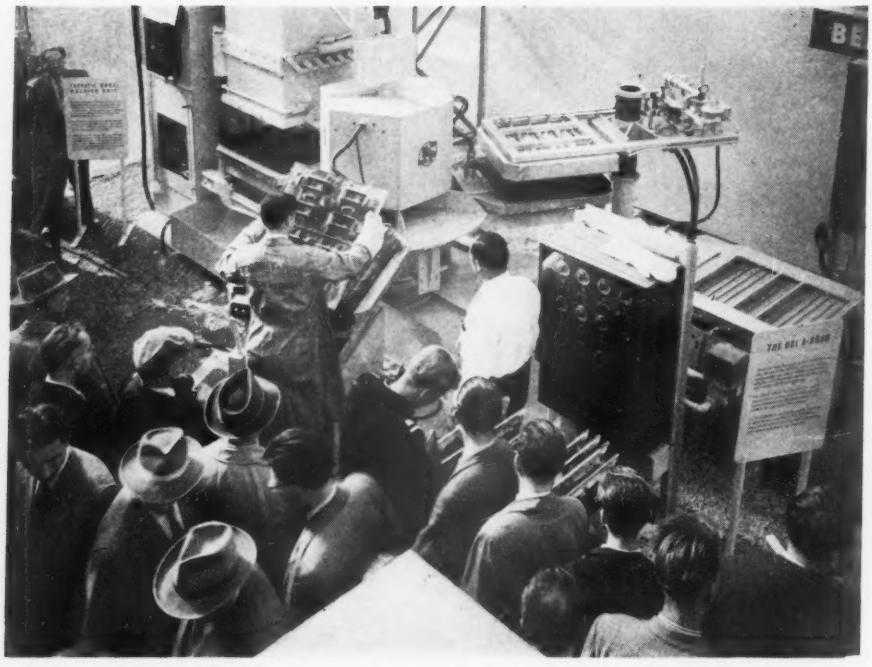


Visitors to the Congress showed considerable interest in shell molding exhibits. This view shows the booth of Beardsley & Piper Div., Chicago

12 minutes, depending upon the equipment used.

The main difficulties of the green sand molding practice are related to quality control. The most important difficulty is failure to properly ram the molds. Other problems are pattern damage and draw difficulty as a result of ramming to high hardness, mold drying during ramming and finishing, scabbing, and metal penetration.

The advantages can be enumerated as: (1) shorter molding time; (2) lower cost because of lower drying costs; (3) good mold accuracy, and (4) less hot tearing.

**Investigations on Sand Mixers and Sandslingers,** by W. Gesell, Duisburg, Germany—An investigation of mixers was carried out to examine the connection between strength values and maximum homogeneity. The results led to the conclusion that maximum homogeneity and maximum strength coincide. An additional result was that the size of the machine influences the characteristic properties of the sand. This leads to the conclusion that sand testing in the laboratory can only serve as a guide for the practical preparation. This was also confirmed by experiments on four trough mixers of varying sizes but of identical construction.

Still more pronounced will be constructive differences e.g. of roll mixers, in their effect on specific press power or in the amount of relative movement of the kneading structures. Further experiments confirm the view that after intensive mixing and pug-milling the clay bond is so well distributed, that storage has no essential influence on the sand's characteristics.

Experiments with used sand heated to 120° C, showed that sand throwers cool better in direct relation to a higher speed of throw. The heat of evaporation is also an important factor in the cooling effect. The question whether sandslingers of different construction would show different results remains unanswered because it is difficult to adjust these types of machines to equal speeds.

**Investigation of the Isothermal Changes of Cu-Cr and Ni-Cr-alloyed Cast Iron Containing 0.5% Mo,** by A. De Sy, Belgium—The results refer to the investigation of the isothermal transformation of several different cast irons. One of these cast irons is unalloyed, the other six each contain 0.5-0.6 per cent Mo and 0.25 per cent Cr, coupled with varying copper and nickel contents.

Summing up, the authors express the opinion that a cast iron with additions of Mo and Cu is particularly suitable for obtaining a bainite-martensite structure with uniform hardness between 300 and 500 Brinell, according to the temperature applied for the isothermal treatment. In addition, they confirm the well known fact that the simultaneous addition of the elements molybdenum and copper is the most favorable one for obtaining an acicular structure by slow cooling, e.g. in the "as cast" state.

**Influence of Silicon and Phosphorus on the Annealing Brittleness of Malleable Cast Iron,** by P. Bastien, P. Azou and Miss Winter, Paris, France—Temper embrittlement of malleable iron is investigated by testing mechanical strength, both at room temperature and at elevated temperature, by dilatometric tests and by x-rays. Special consideration is given to the influence of silicon and phosphorus.

The influence of these two elements on the position of the transition-temperatures is clearly shown.

A theoretical explanation of the embrittlement process is proposed, taking into consideration the possibility of iron carbide formation at 475° C.

**The Automatic Buehrer Molding and Pouring Plant in the Malleable Iron Foundry of George Fischer Ltd., Schaffhausen,** by Walter Goetz, Schaffhausen, Switzerland — George Fischer Ltd., Schaffhausen, have installed in their malleable iron foundry the first automatic Buehrer molding and pouring plant. In designing this plant, the European conditions inherent to small or medium sized castings were taken into consideration.

Clay-bonded sand is used as the molding medium. The mold is first precompacted by jolting. After the required formation of sand above the top edge of the flask has been obtained, the mold is compacted to its final stage by jolt-squeezing.

The described process results in molds of greater consistency with regard to hardness, so that the pattern plate can be utilized for more patterns. The new type of mold gripping and stripping device prevents the molding flask from tilting during the stripping operation, so that a minimum of damage is assured. This device necessitated the construction of a new type of molding flask.

A specially designed clamping frame allows for a quick exchange of the individual sectional pattern plates and further to mold various types of plates at the same time, e.g. metal and plaster pattern plates.

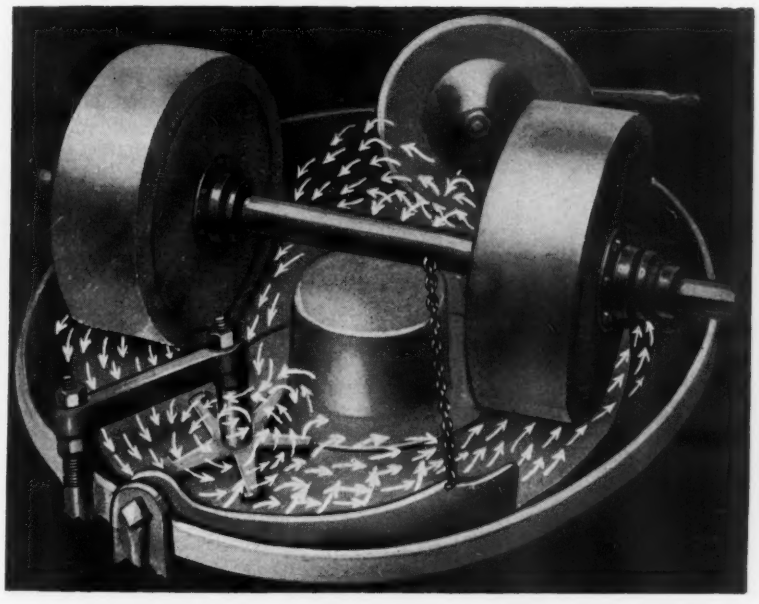
The transfer of molds to the conveyor, as well as the closing of molds, requires a precise and tight gripping of the mold by the holding devices and complete coordination of the various movements.

In the pouring operation a controlled amount of metal is poured from a stopper ladle into a pouring ladle and this amount is sufficient to fill the entire mold without any waste. A pouring basin connected with the sprues of the sectional pattern plates is employed.

Flasks are knocked out on a specially designed vibrator without damaging the flask, which then returns to the molding machine.

The pallet conveyor is arranged

# the STAR feature of a CLEARFIELD MIXER



**Here is what it does:**

1. **Speeds up the mixing process**
2. **Improves the sand quality**
3. **Breaks down all lumps**
4. **Prevents cake formation**
5. **Frees bottom surface of all material**
6. **Promotes clean emptying of the pan**

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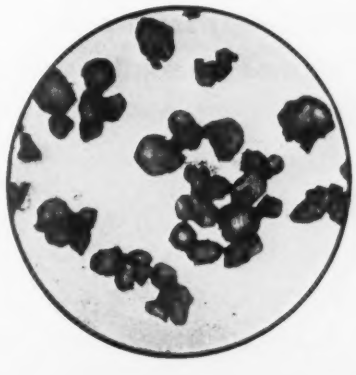
The agitator is attached to an arm suspended in the revolving pan. As the pan bottom revolves, the sand strikes the agitator causing it to turn rapidly. This creates an intense mixing action, preventing any buildup of material on the bottom of the pan.

**VISUAL EVIDENCE** of the effectiveness of Clearfield Mixers is provided by these photomicrographs. Left, unbonded silica sand. Right, the same sand bonded in a Clearfield Mixer.



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with the return track situated below the advancing track so that the pallets are transfered from one track to the other by a special device.

**Creep Resisting Steel Castings for Medium and High Temperatures,** by Dipl.-Ing. H. Zeuner, Remscheid, Germany—Ferritic steels with up to 5 per cent alloying elements begin to scale at about 530° C and for this reason the steam turbine manufacturers have changed over to austenitic materials, although in usage they only slightly exceed the above-mentioned temperature. Recent thorough investigations have now created a ferritic steel which is scale resisting up to 600° and still has at this temperature a satisfactory long-time creep resistance. This material has stood up well to practical tests which have been conducted.

Materials used in turbine manufacture which are required to withstand temperatures up to 750° and materials for the construction of furnaces where temperatures up to 1200° have to be expected, are all austenitic.

Suitable casting alloys are being developed for gas turbines as well as for special driven gear parts. At the present time the materials marketed for these purposes are mainly the typical alloys used in the production of forgings.

By using a cast steel with a higher carbon content, an austenitic heat resisting material can be obtained which has a better long-time creep resistance than forged parts with similar Cr- and Ni-alloy contents.

A number of ferritic casting alloys with good hot-strength compare favorably with forgings of the same composition because of the better annealing results, and by virtue of a stable casting structure their long-time creep resistance is superior to forgings. On principle, the most searching investigations indicate that —taking a long term view—annealing provides the best long-time creep resisting properties.

**Casting Properties of Some Nickel-base and Other Nickel-containing Alloys,** by D. R. Wood and J. F. Gregg, London—The investigations described in this paper established casting quality to be of greater practical significance than fluidity. Fluidity was shown to be relatively insensitive to changes in composition and was related to the amount of superheat. Casting quality, on the other hand, was related to chemical composition rather than to superheat.

While it must be accepted that the factors governing the relationship between flow of molten metal and the quality of surface produced in a given mold are not fully understood, it is regarded as significant that alloys showing poor casting quality con-

tained chromium and had low silicon contents. It is considered possible that the casting quality is influenced by the existence of oxide films on the molten alloys. The difference in properties between silicon and chromium oxides might explain the striking superiority of high-silicon alloys as compared with low-silicon, chromium-containing alloys.

**Hydrodynamic Investigations of Mold Filling Capacity,** by E. Scheil, Stuttgart and D. Pohl, Wetzlar, Germany—Investigations were carried out on the hydrodynamics of the flow of metals through sand tubes. For this purpose a very simple flow apparatus was built and used for measuring the velocity of discharge.

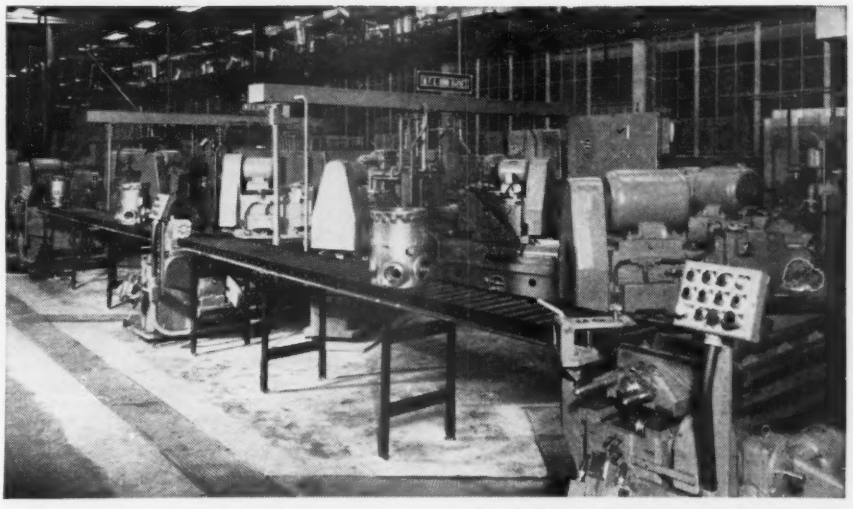
It was found the discharge apparatus with its measuring tube had already a noticeable resistance, which will have to be kept as low as possible in future investigations. Taking this resistance into consideration, the measured values in a graph using the resistance number $\lambda$ as the ordinate and Reynolds number Re as the abscissa, could be represented quite well by a rising straight line approximately within the range of resistance values measured for water flowing through a rough tube. Differences between hydro-dynamics of water and of metals are discussed.

**New Methods in Thermodynamics and in the Calorimetry of Alloys,** by W. Oelsen and E. Schurmann, Clausthal-Zellerfeld, Germany—It has been lately shown, at the Institute of Iron Metallurgy and Foundry of the Mining School at Clausthal, that the heat content of alloys could give the main constants from which may be deduced all the other constants used in thermodynamics. This makes it possible, in many cases, to deduce from the results of calorimetric measurements, the mixing heat, the entropy of mixing and the affinity of formation of alloys, as well as the activities of the components of mixtures, and to draw a number of conclusions about the properties and inner forces of materials, which open to thermodynamic measurements and calculations a new and almost unbounded field of metallography and metallurgy.

A decisive improvement of the measurement of heat contents of pure substances and alloys is afforded by the method developed by Oelsen et al. under the name of "quantitative thermal analysis", which combines in effect the classical thermal analysis by means of "cooling curves" (in the Tammann sense) with calorimetric measurements.

**Measurement of the Surface Tension of Cast Iron,** by D. Pohl and E. Scheil, Stuttgart, Germany—While the method of measuring surface ten-


# Ask Standard ... how to cut costs with conveyors

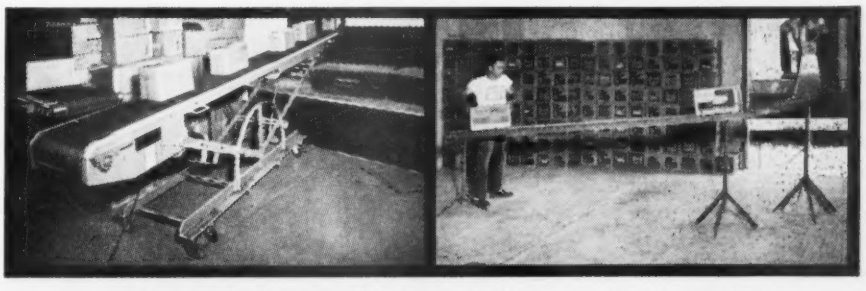


Standard gravity roller conveyors like this are modest in cost, easy to install and maintain.

## Conveyor system helps Airtemp up compressor parts production 40%

To handle stepped-up demands for residential and industrial air conditioners, the Airtemp Division of the Chrysler Corporation undertook an extensive re-tooling program. On one compressor crankcase line, for example, they installed 17 new machine tools . . . connected them all with Standard gravity roller conveyors. Result — two hours saving per case, production up 40%.

If you're planning on modernizing or retooling it will pay you, too, to find out how Standard conveyors can complement new equipment . . . give you lower overall costs and greater productive efficiency. STANDARD CONVEYOR COMPANY, North St. Paul 9, Minnesota. Sales and Service in Principal cities.



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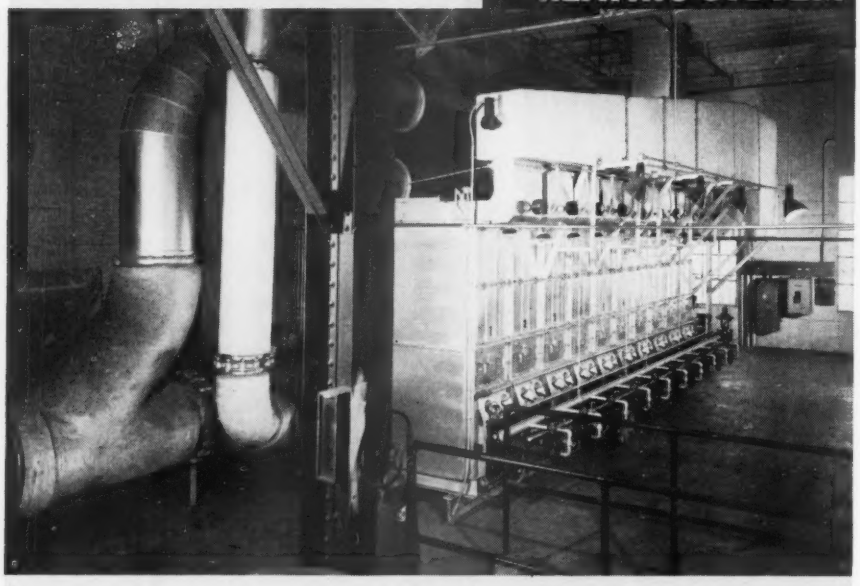
Circle 707 on Inquiry Card—Page 217

# Cuts Cupola Operating Costs

## while increasing tonnage

## ROSS HOT BLAST HEATING SYSTEM



Overall view of ROSS Hot Blast System from discharge end showing hot air header and cold air bypass joining pipe to cupola.

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AVOID BRIDGING

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MORE CARBON PICK-UP

QUICK START-UP

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The system can be installed without interfering with cupola operations. Heaters are available for delivering air up to 1000° F. and air pressures up to and above 5 lbs.

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sion by means of oscillating jets has so far been used only on melts of low melting metals, it can also be used successfully for cast iron.

The influence of silicon, phosphorus and sulphur on the surface tension of cast iron melted in ordinary foundry practice has been established by this method. Sulphur additions reduce the surface tension, so does phosphorus, but its influence is only about one-sixth that of sulphur.

Silicon additions cause only a smaller reduction of the surface tension. By using cast spirals a relation with mold filling capacity was established; the running length of the spiral is shorter if the surface tension is high and vice versa.

**Effects of the Treatment of Molten Casting Alloys,** by K. Lohberg, Oberursel, Germany—The presence of a small quantity of phosphorus in aluminum-silicon alloys produces a polyhedron crystal habit of the silicon, and a degenerate eutectic (after the concept of Scheil) which can hardly be undercooled. Phosphorus-free alloys, however, show primary silicon dendrites and a lamellar eutectic, which can be undercooled and is not degenerate. In both cases, addition of sodium achieves a finer grain of the eutectic which is known as "grain refinement".

In hypereutectic lead-antimony alloys, antimony crystallizes in polyhedron shape, if the alloys contain sulphur. In sulphur-free alloys, however, plate shaped antimony crystals are formed. Crystallization in the one or other habit can be enforced, with constantly reproducible results, by sulphur or sodium.

It is believed additions of phosphorus and sulphur with the metallic components of the alloys, form the nucleating compounds, aluminum phosphide (AlP) and lead sulphide (PbS) respectively, and crystallographically these are similar to silicon and antimony respectively.

The effectiveness of the compounds aluminum phosphide (AIP) and lead sulphide (PbS) is upset by sodium, possibly as a result of the formation of sodium phosphide ($Na_3P$) or sodium sulphide ($Na_2S$).

Additions to cast iron causing the spheroidal formation of the graphite (magnesium, cerium) appear to have a disturbing effect on the nuclei which initiate the crystallization of flake graphite. Apparently the cast iron melts are refined by the above mentioned additions and thus become capable of undercooling.

**The Application of the MTM System in the Planning of Foundry Work,** by J. Edman, Skovde, Sweden—One production engineering tool is methods-time measurement, called MTM, which measures the relation-

ship between method and time, thereby giving a direct measurement of productivity.

At the author's foundry, this method has been used for several years. Experience gained gives proof that systematic work simplification carried out with the help of the system can to a great extent increase foundry productivity. This foundry uses the time standards as fundamentals for production planning, all the way through from preparation to completed production. The use of the system in developing methods has proved to be far superior to the conventional tools employed in work study engineering.

**Future Problems of Research in Foundry Techniques,** by Ove Hoff, Copenhagen, Denmark—In spite of worthwhile technical developments, a great need still exists for foundry technical research. The author suggests investigation of the following:

Connection between properties, composition and production methods for pig iron to provide such material with desired properties. Control of application qualities of gray iron. Control of cupola melting to provide iron of any desired composition. Development of better mold materials and molding methods to supply improved cooling rate, better permeability and casting accuracy as well as cheaper molds. The possibility of use of porous sintered metal and ceramic combinations. Improved mold and core machines as well as other mechanical aids. Better knowledge of metal flow in the mold cavity for the basis of scientific gating technique.

Technical research conducted in large plants alone is not sufficient. The results should be published in intelligible form so that the smaller foundries can make use of them. For better results in all phases of foundry technique close co-operation and information exchange between researchers and research institutions is necessary. Perhaps formation of a joint research center for publication of results and organization of co-operative efforts would assist in obtaining quick success on all problems.

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Chicago Flame Hardening Co. is opening a new plant designed to provide service for hardening all types of iron and steel products in the industrial area embracing greater Chicago. The company is situated at 420 East 151st St., East Chicago, Ind.

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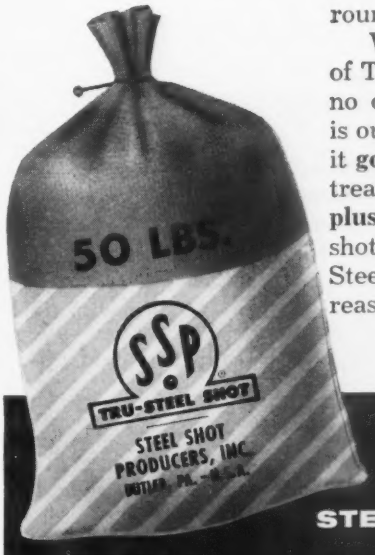


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Circle 709 on Inquiry Card—Page 217

Building pallet load of castings, worker puts six castings in each tier. He also places four light, corrugated-board dividers between each course

Steel strapping binds all of the castings firmly together

# PACKAGING METHOD

## *Saves Time and Costs*

TO hold the line against rising manufacturing costs, Precision Castings Co. constantly creates new methods to move raw and finished material. A division of Harsco Corp., the company makes die castings for automobiles, washing machines, escalators and many other products at plants in the Syracuse, N. Y., Chicago, and Cleveland areas. About 4,000 different dies are used to produce castings.

Well balanced unit of 54 castings is moved easily by truck

At its Syracuse plant, the company formerly packed six castings for auto transmission torque converters in a corrugated-board container. Thousands of containers 34 by 18 in. wide and 21 in. deep had to be kept in supply. Valuable floor space, which could have been utilized for casting storage, thus was preempted by cartons.

Moreover, after it had been packed, each carton was sealed and addressed individually. From packing to shipment from the plant, each carton was handled separately because of the weight factor. Each casting weighed 10.06 lb and a packed container in excess of 65 lb.

It required an hour and a half for two men to load cartons packed with castings on a truck trailer. In addition, the use of cartons was costly to customers. Breakage occurred, consignees had to unpack the cartons, and it was necessary to store or scrap the empties. A shipment of castings often ran into hundreds of cartons.

Because of all these difficulties Precision Castings switched to packaging castings by the Stanley steel strapping "Uni-tie" system.

Now, for example, one man can load the same type of truck trailer in half an hour. Pallets on which castings are loaded and strapped are stored neatly one on top of another, and no more than 100 pallets need be on hand at a time.

Packaging of castings with this system is an efficient operation. As illustrated here, a material handler takes a pallet and places six castings, two wide and three long, on its surface. The middle castings are turned up. He then places four light pieces of corrugated-board over the six castings and builds the second layer. Like ends of the castings are put end to end. Nine tiers are built.

After the ninth layer has been placed, ½ by 0.018-in. steel strapping is passed under the center of the skid. It then is laced through openings in the center castings on the long side of the pallet and passed through the openings on the lower ends of the ninth tier of castings. The strapping is tensioned with a tightener and sealed at the side of the unit.

Two pieces of lumber are placed across each of the two castings on the short sides of the pallet. Two steel straps then are passed through openings in the first level of castings and straight up the sides of the castings. The straps are passed over the wood blocks, tensioned and sealed. Two steel straps are passed under the long side of the pallet and laced

through openings in the castings on each of the nine courses. After they have been passed longitudinally over the wood blocks, the straps are sealed. Thus, five straps envelop the castings.

The resulting structure of 54 castings is perfectly balanced and can be moved easily and quickly with a fork lift truck. Injuries which occured from lifting and dropping cartons of castings virtually have been eliminated both at Precision Castings Co. and at its customers' plants. Truckloads of palletized castings are shipped to points as far as Detroit.

Packaging time has been cut over 50 per cent, and thousands of dollars already have been saved for the company. Frank A. Agan, chief inspector for Precision Castings, said the biggest boost the firm has received in saving time and money was the introduction of this steel strapping system.

The company was assisted in implementing this method of packaging castings by Weldon A. Chase, sales representative for Stanley Steel Strapping, division of Stanley Works, New Britain, Conn. In a recent nationwide contest for new packaging ideas sponsored by his company, Mr. Chase won $100 for submitting the Precision Castings story. Officials at Stanley called it a prime example of creativity and cost savings in steel strapping packaging.

## Engineering and Management Course Set for Los Angeles

An engineering and management course will be offered on the Los Angeles campus of the University of California next Jan. 21-31. The program is designed to be of value to all levels of engineering and man-

"All right, take that confounded thing off and I'll throw away the cigar!"

Planet belt conveyor transferring briquets to *adjustable* boom conveyor.

# This Planet Conveyor Handles Briquets *with kid gloves*

At one of the world's largest automotive foundries, this Planet boom-type belt conveyor makes the vertical adjustment necessary to lower briquets to yard storage level with a minimum of breakage.

The foundry pours over 1,000 tons of gray iron in a 16 hour day. A good percentage of the pouring is cylinder iron which averages 1,000 lbs. of cast iron briquets in each 4,000 lb. metal charge for the cupola.

In the cupola the tremendous air blast delivered by three centrifugal fans, each with a 17,500 cfm rated capacity at 40 oz. pressure, **makes short work of briquet fragments.** Inasmuch as the cast iron briquets make up almost 25% of the metal charge, the savings in keeping briquets intact is considerable . . . results in more metal, less waste.

You can save money with Planet foundry automation. Whatever your specific problem, within the foundry or in yard storage, Planet foundry specialists can cut your operating costs. Start the ball rolling today with a letter or phone call. Phone IVanhoe 4-9433.

**PLANET CORPORATION**
1818 SUNSET AVENUE
LANSING, MICHIGAN

- CONVEYORS
- ENGINEERED SYSTEMS
- FOUNDRY EQUIPMENT
- AUTOMATION
- STEEL FABRICATION

**"IT PAYS TO PLAN WITH PLANET"**

agement personnel. A daily instruction period for each of 25 different subjects for the full ten days will be included in the lectures.

Subjects to be covered will include general management principles, engineering and research administration, managerial adjustment to labor law and union relations, leadership principles, the economics of plant investment and equipment replacement, a laboratory in leadership and work in motion study, etc.

Information concerning course material, housing and registration details is available on request to Edward P. Coleman, Engineering Extension, Room 3104, University of California, Los Angeles 24, Calif.

## National Safety Council Issues 1955 Accident Rate Data

The 1955 edition of "Accident Rates," a 50-page booklet which gives the accident rates for various industries on the basis of reports of National Safety Council members, now is available. In addition to current rates, the booklet includes historical summaries of rates for various industries. In 1955, the frequency rate of foundry industry NSC members was 9.45 and the severity rate 814. The frequency rate represented a rise of 7 per cent from 1954 and the severity rate a drop of 6 per cent.

For further information about "Accident Rates," write to the National Safety Council, 425 North Michigan Ave., Chicago 11, Ill.

## Alloy Precision Castings Occupies New Foundry

Alloy Precision Castings Co., Cleveland, recently moved to a new plant at 3855 West 150th St. For a number of years the company had been located at East 45th and Hamilton in that city. The most modern facilities are available at the new plant for the production of investment castings by the frozen mercury and lost-wax processes.

The company was a pioneer in use

Dipping a large frozen mercury pattern into a ceramic slurry

of the Mercast process in which a pattern is formed by pouring liquid mercury into a die, which then is immersed in a freezing bath. After the frozen pattern has been coated with a ceramic slurry to build up a shell mold about ⅛ in. thick, the assembly is brought to room temperature and the mercury is melted out. The mold is fired at a temperature of about 1850°F for two hours prior to being poured.

Recent adoption of a lost-wax department permits the company to apply which of the two investment processes is best adapted to the production of a specific casting.


**Cut foundry operating costs . . .**

Transite Core Plates are strong and durable . . . resist warpage, impact and abuse, provide long service life.

**with Transite Core Plates and Slip Jackets**

"Johns-Manville Transite* Core Plates help assure maximum production in minimum time"—that's the experience of foundrymen who have used them for years. Made of asbestos and cement, they are light in weight, yet strong and durable. Being non-metallic, they resist corrosion, maintain their smooth surface and can be easily cleaned.

Transite Slip Jackets are a companion product with similar advantages. They do not burn, retain their original shape despite runouts. Slip jackets are furnished in both white and black types. The latter is widely used as a protective liner for metallic slip jackets.



**FREE . . . New Folder** gives complete details on Transite Core Plates and Slip Jackets—as well as Transite Pallite products for dielectric furnaces. For your copy of folder PP-31A, write Johns-Manville, Box 14, New York 16; in Canada, 565 Lakeshore Road East, Port Credit, Ontario.

Transite Slip Jackets cost less than other types . . . last longer, too. Result—important savings for foundries.

*Reg. U. S. Pat. Off.

Johns-Manville TRANSITE CORE PLATES AND SLIP JACKETS

## Establish Research Center On Technical Training

As a result of serious concern over the shortage of scientists, mathematicians and engineers in the United States, Stanford Research Institute, Menlo Park, Calif., plans to establish a Center for Scientific and Engineering Manpower and Education Research. This center will spearhead a broad research and action program on the utilization of existing technical manpower and the education of scientific and engineering personnel.

A tentative program has been established which embraces five general fields of activity: Fundamental research, consulting service, action research, information service and development of materials. Cost of this program, initially planned to be of five-year duration, is estimated to be about $475,000. It is anticipated that these costs would be shared by a number of participating industrial and other interested organizations.

## Apprenticeship Program Is Described in New Booklet

A popularly written, illustrated booklet describing the national apprenticeship program has been released by the U. S. Department of Labor's Bureau of Apprenticeship.

Titled "Apprentice Training—An Investment In Manpower," the 32-page booklet explains in nontechnical language the aims, organization, and operation of the national apprenticeship program.

According to W. F. Patterson, bureau director, the booklet is designed to answer inquiries concerning the national apprenticeship program received from employers, labor unions, young persons interested in learning a skilled trade, vocational guidance counselors, employment officers, and others concerned with industrial training.

Copies of the booklet may be obtained free of charge from the Publications Branch, Bureau of Apprenticeship, U. S. Department of Labor, Washington 25, D. C.

## Gray Iron Founders Publish Buyers Guide and Directory

A new edition of its *Buyers Guide and Directory* has been published by Gray Iron Founders' Society, National City-East Sixth Bldg., Cleveland 14, O.

It includes an alphabetical list of the member companies and detailed information covering personnel, casting size and production, type of foundry and special services available. The buyers guide is a breakdown of major types of castings, and those members which produce them are listed under the various headings.

In another separate section, members are listed geographically as well as by name.

Now in operation, this new production foundry is operating continuously over two 8 hour shifts, employs 2,000 workers and is pouring 1000 tons of gray iron every 16 hours. Cores and molds are baked and dried in Despatch Ovens.

**DESPATCH OVEN FEATURES**

***Increased Production***—100% convection heat and up to 75% recirculated air give speedy warm up, fast heat recovery after reloading and fast baking.

***Quality Baking***—Heavy duty, high volume fans give speedy heat transfer, assure uniform baking.

***Approved Control***—Despatch ovens are equipped with automatic temperature controls and fire underwriter approved safety systems.

***Efficient Operation***—Direct gas or oil fired heaters cut fuel costs . . . for more information about Despatch Foundry Ovens . . .

*Write for Bulletin 31, or request a representative call.*

Minneapolis Office: 619 S.E. 8th St. Chicago Office: 4554 N. Broadway

*Sales and Service in all Principal Cities*

DESPATCH OVEN COMPANY

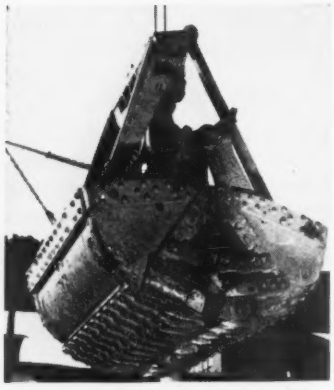
PIONEERS IN ENGINEERING HEAT APPLICATIONS FOR INDUSTRY




Circle 712 on Inquiry Card—Page 217

# BLAW-KNOX

## DUAL-PURPOSE FOUNDRY BUCKET
## Cuts Coke and Sand Handling Costs



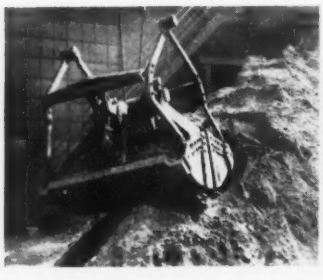
**HANDLES COKE WITH MINIMUM DEGRADATION**

●

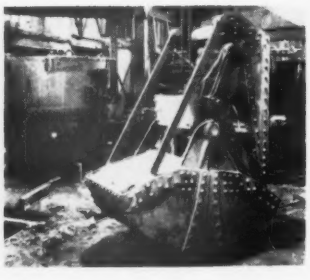
**HANDLES SAND WITH MINIMUM LEAKAGE**

Blaw-Knox "Shark Tooth" Single-Line Hook-On Buckets are the double-barrelled punch you need to cut the cost of rehandling coke, coal, sand and small limestone, *because they are dual-purpose buckets.* With liner plates attached, you can handle fine granular materials with minimum leakage. Without the liner plates, the "shark teeth" assure minimum degradation of coke.

**BLAW-KNOX SINGLE-LINE HOOK-ON TYPE BUCKETS SOLVE AVERAGE OR UNUSUAL HEADROOM CONDITIONS**



**For extremely limited headroom, this ¾-yd. bucket requires only 6'7" operating headroom. Blaw-Knox Buckets designed for low headroom conditions are also available in larger sizes.**



**For average headroom, there's a size and type of Blaw-Knox Foundry Bucket to meet a wide range of conditions. Write for Bulletin 2232 for details.**

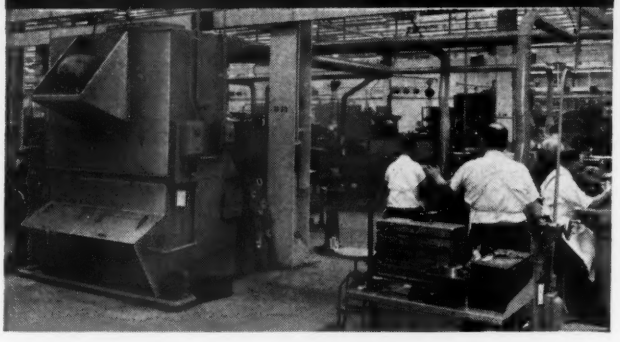
## BLAW-KNOX COMPANY
**BLAW-KNOX EQUIPMENT DIVISION**
**Pittsburgh 38, Pa.**
***Offices in Principal Cities***

**BLAW-KNOX FOUNDRY BUCKETS**
**BLAW-KNOX**
***THE MOST COMPLETE RANGE OF SIZES AND WEIGHTS***

---

**NEWCOMB-DETROIT** EST. 1912

- **INDUSTRIAL OVENS**
- **DUST COLLECTORS**
- **SPRAY BOOTHS**
- **PARTS WASHERS**



## UNI-WASH DUST COLLECTORS

Compact, complete recirculating Water-Type Dust Collectors for industrial processing dusts. Dirt is collected as wet sludge which may be carried away automatically. No moving parts. Extremely efficient for grinding operations. Eliminates danger of explosion from magnesium and aluminum dust. Proven in foundries. Standard Units available.

***For Bulletins and Quotations, write to:***

**NEWCOMB-DETROIT**

5755 RUSSELL ST. • DETROIT 11, MICH.

***Circle 714 on Inquiry Card—Page 217***

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**HOW MUCH IS "DOWN-TIME" COSTING YOU?**

**Replaces conventional pneumatic tires on Payloaders, Fork Trucks, Tractors, Industrial Carts and other Industrial Equipment.**

**LOAD CAPACITY** equal to the heaviest ply pneumatic tire.

**TRACTION** far superior to any continuous tread tire. Mitco Tires have sure-grip tread.

**RESILIENCY** of the Mitco Tire compares favorably with pneumatic tires.

**STEERING** is easier, more accurate, when industrial equipment has Mitco Tires.

## NO FLATS
**WITH MITCO INDUSTRIAL TIRES!**

No work stoppage caused by punctures or blowouts!

Try a Set of **MITCO'S** Satisfaction Guaranteed!

**Write or wire us for Nearest Distributor**

**MITCHELL INDUSTRIAL TIRE COMPANY, INC.**
**P. O. Box 468, Chattanooga, Tennessee • Phone TAylor 1-7531**

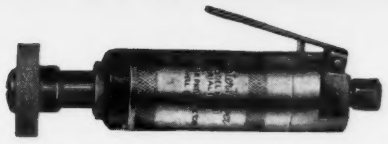


***Circle 744 on Inquiry Card—Page 217***

***Circle 715 on Inquiry Card—Page 217***

# Master Power

HARD CHROMED • PORTABLE PNEUMATIC TOOLS



**DO MORE WORK AT LESS COST**

because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

**ARE PREFERRED BY OPERATORS**

because they are lighter in weight, better balanced and designed to reduce shock and be free from vibration.

**IF YOUR PROBLEM INCLUDES**

chipping, ramming, grinding, buffing, sanding or wire brushing, *write us today for full particulars.*

**THE MASTER PNEUMATIC TOOL COMPANY, INC.**

ORWELL, OHIO • U. S. A.

SALES ★ SERVICE ★ STOCK ★ COAST TO COAST

*Circle 716 on Inquiry Card—Page 217*

# KEEP WORK AREAS WARM
## . . . improve worker efficiency!

**Low cost all-purpose heater for shops, foundries and semi-open areas**

HY-LO Portable Heaters are the answer for permanent or temporary heat. Ideal for hard-to-heat areas—temporary heat in emergencies—any standby or supplementary heating!

**WHY HY-LO IS BEST**

- Low 1st cost low operating cost.
- 70,000 to 140,000 BTU per hour!
- Burns only ½ to 1 gal. per hr. of low cost fuel oil.
- One filling lasts 10 to 20 hours.
- Exclusive damper for quick extinguishing.
- Carrying handles for easy moving.

Nationally accepted! Produces more heat per dollar invested than any other heater! Write or wire for nearest dealer.

DISTRIBUTORS IN ALL PRINCIPAL CITIES

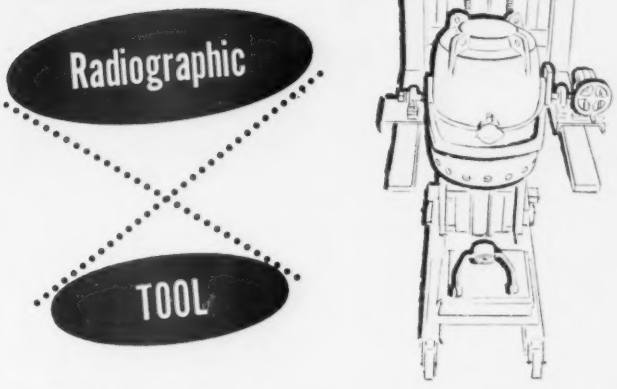
Easily Portable.. HOT & CLEAN!

**Scheu PRODUCTS CO.**

**275 Stowell St., Upland, Calif.**

*Circle 717 on Inquiry Card—Page 217*

# THE KEL-RAY® Projector




## Portable • Safe • Economical • Easy to Use

Here is a versatile tool that "looks through" metal and allows you to see on film the internal structure of castings, welds or fabricated assemblies before you OK them for service. Such pre-service testing lowers future replacement costs, safeguards against service failures, helps to establish and maintain quality standards that invite more business, and offers an economical method of examining metal structures inaccessible to many types of equipment.

KEL-RAY Projectors employ radioactive cobalt, iridium, or cesium as a source of gamma rays. Built in three portable sizes, the smallest of which can be moved by hand, each is suited to specific applications depending on the source used and the radiation pattern required. Designed to withstand rough handling, Kel-Ray Projectors are safe, economical to own and operate, simple to use for anyone properly trained.

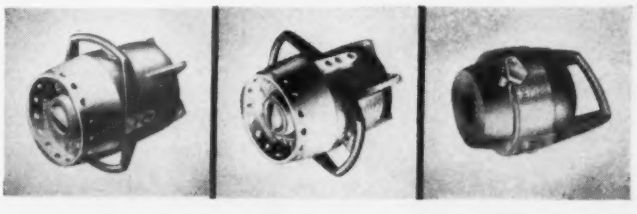
KEL-RAY Projectors can keep an economical eye on the castings, welds, or assemblies on which *your* future business depends.

• *For information, please write.*

**METAL & THERMIT CORPORATION**

GENERAL OFFICES: RAHWAY, NEW JERSEY

WELDING SUPPLIES • RADIOGRAPHIC EQUIPMENT • PLATING MATERIALS • ORGANIC COATINGS
CERAMIC MATERIALS • TIN & TIN CHEMICALS • METALS & ALLOYS • HEAVY MELTING SCRAP



*Circle 718 on Inquiry Card—Page 217*

# SILICAMIX . . . a new, superior, gun-shot CUPOLA PATCH

**BUCKEYE SILICAMIX** is a new development that provides a superior gun-shot mix for patching gray iron cupolas. Its uses provide the same qualities and results from this gun-shot material that have been so popular with the well known Buckeye Silica Firestone. Buckeye Silicamix is actually small pellets of this firestone, coated with clay—a special refractory fire clay. When applied under pressure with water, Buckeye Silicamix sticks tighter to the cupola walls, keeping costly "drop" to a minimum.

## Try SILICAMIX on your cupola patching job . . . . . .

A Buckeye refractory engineer will bring you free samples for inspection and trial. See for yourself how its faster "buckshot" action adds up to more economical cupola operation.

## SILICA CHEMICALS, INC.

**Subsidiary of The Cleveland Quarries Co.**

**AMHERST, OHIO**

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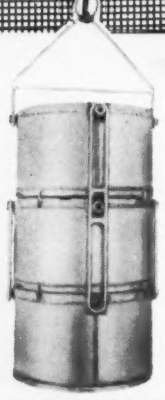


**for HEAT TREATING—BAKING —ANNEALING FIXTURES**

*Call Wiretex* **BASKETS MUFFLES • SCREENS • GRIDS RACKS • ETC.**

Every Weave, Alloy, Size, Load, Process and Quantity.

STANDARDS or CUSTOM MADE TO YOUR SPECIFICATIONS.

**Wiretex mfg. co.**

SEND FOR CATALOG **26 Mason St., Bridgeport 5, Conn.**

*Circle 720 on Inquiry Card—Page 217*

## FOUNDRY

EDWIN S. CARMAN, INC.

LEE ROAD AT MAYFIELD
CLEVELAND 18, OHIO

A COMPLETE FOUNDRY SERVICE

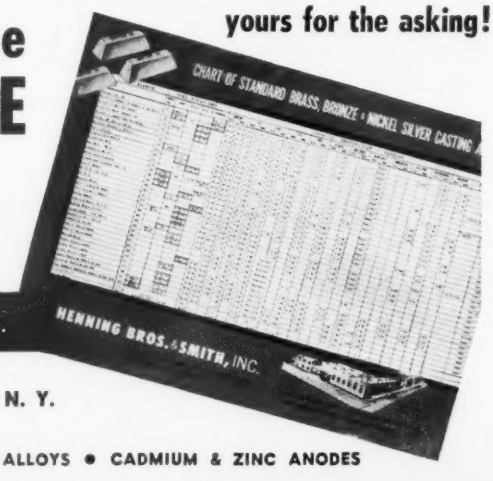
**MODERNIZATION**

*Circle 721 on Inquiry Card—page 217*

## send for this valuable quick-reference 17" x 22" standard alloy wall chart FREE

**yours for the asking!**

This see-at-a-glance wall chart will save you hours of time in making up your specs. Chart shows all types of customer specifications: Navy, S.A.E., A.S.T.M., and Federal. It shows chemical composition, by percentages, of 37 alloys. Write today for your copy to:




**HENNING BROS. & SMITH, INC.**

*"Dependable Service Since 1922"*

**91-125 Scott Ave. at Randolph St., Brooklyn, N. Y.**
**HYacinth 7-3470-1-2-3**

**ZINC BASE ALLOYS • BRASS, BRONZE & ALUMINUM INGOTS • LEAD & TIN BASE ALLOYS • CADMIUM & ZINC ANODES**

*Circle 722 on Inquiry Card—Page 217*

## No. 4 DAYTON RING VALVE BENCH RAMMER

**MORE POWER—MORE SPEED**

You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

*Send for Bulletin 300*

**DAYTON PNEUMATIC TOOL CO.**

*Manufacturers of Pneumatic Tools Since 1903*

**DAYTON, OHIO**

*Circle 723 on Inquiry Card—Page 217*

## WHAT DO YOU NEED IN A COST METHOD

**The simplest and most complete method of costing ever prepared for nonferrous foundries is found in**

## *BASIC COST PRINCIPLES FOR NON-FERROUS FOUNDRIES*

(Non-Ferrous Founders' Society Publication)

Up-to-the-minute guide for costing in both small and large foundries. Prepared by practical foundrymen, based on 10 years of research and experience of the industry under Government Pricing Regulations.

Price $5.00 Postpaid

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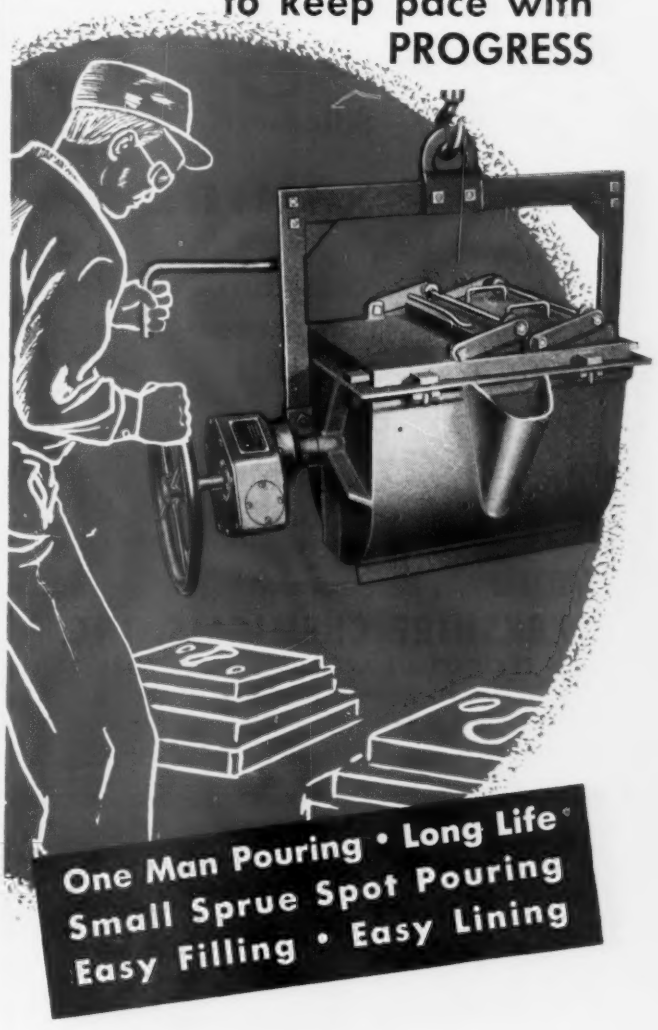
## *JOB ENGINEERED*

to keep pace with PROGRESS



**One Man Pouring • Long Life**
**Small Sprue Spot Pouring**
**Easy Filling • Easy Lining**

One of America's largest manufacturers requested a ladle capable of fast, economical spot pouring of shell molds. This special ladle was Industrial's Job Engineered solution to this foundry problem.

For high speed production line pouring, you can lower labor costs . . . reduce rejects . . . protect flasks and conveyors from spillage . . . and increase production with production-planned foundry equipment by Industrial.

For nearly half a century, Industrial has contributed to Foundry Progress by offering constantly improved pouring and handling equipment featuring forward-looking designs.

Let Industrial help you solve your pouring problems. Write today for latest catalog.

**Industrial**
**EQUIPMENT COMPANY**
**115 OHIO ST., MINSTER, OHIO**

*Circle 724 on Inquiry Card—Page 217*

Zircon Sand
Zircon Flour
Silica

BERKSHIRE BCI CHEMICALS

ISCO

BERKSHIRE

Potassium
Titanium
Fluoride

Potassium
Zirconium
Fluoride

**BERKSHIRE CHEMICALS, INC.**
420 LEXINGTON AVENUE • NEW YORK 17
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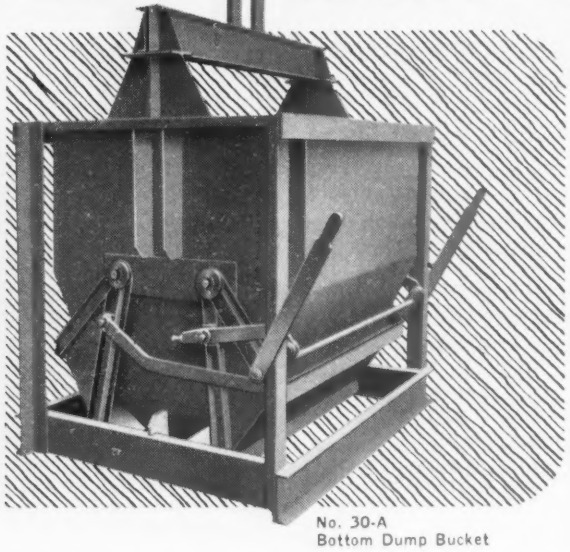
New York • Philadelphia • Boston • Cleveland • Chicago

*Circle 725 on Inquiry Card—Page 217*

# PENN BUCKETS



No. 30-A
Bottom Dump Bucket

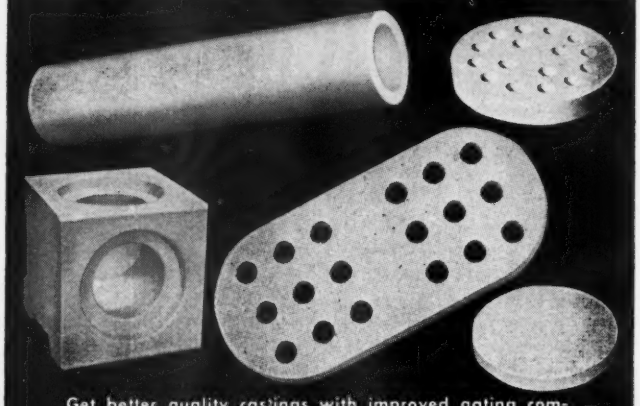
Exclusive design makes this bottom dump bucket easy to operate . . . easy to open. Efficient for foundry use in handling all types of sand, moulding or core, dry or prepared. Can be used with coke, scrap iron and castings also. Sizes 7 to 200 cu. ft.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

Write Today for Catalog • Prices Quoted on Application

**PENN IRON WORKS, INC.**
READING, PENNA.

# UNIVERSAL CUSTOM-MADE GATE REFRACTORIES

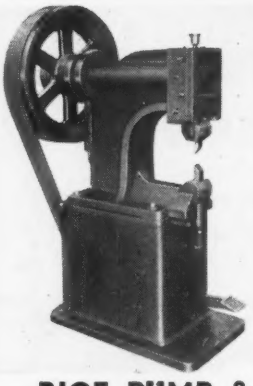


Get better quality castings with improved gating components. Universal refractory strainer cores, pouring pipes, splash cores and elbows are available in standard sizes or can be custom-made to your specifications. In addition, special strainer cores are available for high-manganese bronze.

Send specifications for price and delivery quotation. No obligation. Phone: SAndusky 4631.

**UNIVERSAL CLAY PRODUCTS CO.**
1515 EAST FIRST ST. • SANDUSKY, OHIO

*Circle 727 on Inquiry Card—Page 217*



MILWAUKEE-TESSMER
## Sprue Cutter
*for*
*Non-Ferrous Foundries*

- Cuts Sprues and Gates with One, Swift, Sure Stroke.
- Does away with tedious hand labor.
- Speeds flow of work through cleaning department.
- Built for years of Rugged, Low-Cost Service.
- 2 Sizes, ¾" and 1¼" square. Built-in electric motor or belt drive.

*Write for Illustrated Bulletin*

**RICE PUMP & MACHINE CO.**
222 Park Ave., Belgium, Wis.

*Circle 728 on Inquiry Card—Page 217*

# RINGLIFT SAND CONDITIONER

"The Ringlift has helped us more than any other piece of equipment we have ever purchased", says General Manager of this leading Midwestern gray iron jobbing foundry.

*After More Than 500,000 Tons*

This hot, hard, lumpy sand is prepared, cooled and tempered by the Ringlift without prior addition of water. Sand is mixed, blended, screened, magnetically separated, triple aerated. You, too, can save by preparing your sand properly, right on the floor where it will be used. Investigate Ringlift today.

**STATES ENGINEERING CORPORATION**
922 W. BERRY STREET, FORT WAYNE, INDIANA

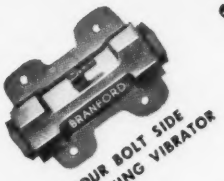


*Circle 726 on Inquiry Card—Page 217*

*Circle 729 on Inquiry Card—Page 217*

*The Trademark of Quality Products*

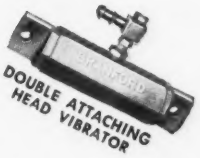
*Since 1915*



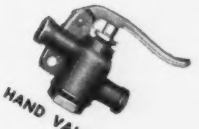
FOUR BOLT SIDE MOUNTING VIBRATOR

HOSE CLAMP

TWO BOLT SIDE MOUNTING VIBRATOR


DOUBLE ATTACHING HEAD VIBRATOR

1915
BRANFORD
VIBRATORS
USA


HAND VALVE

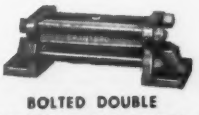
RENEWABLE NOZZLE CLEANER & SPRAYER

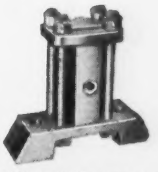
CLEANER & SPRAYER

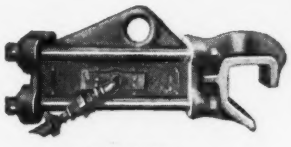
HOSE NIPPLE

STARTING VALVE

HOSE ELBOW


BOLTED DOUBLE ATTACHING HEAD VIBRATOR


END MOUNTING VIBRATOR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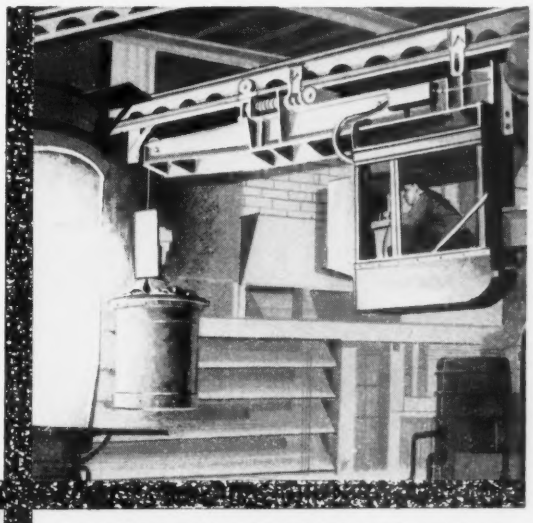

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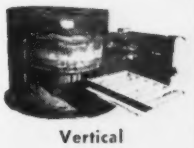
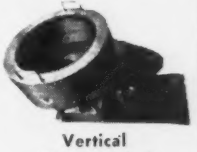
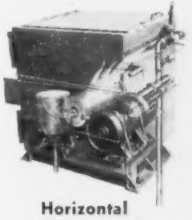
These machines used to make ferrous and non-ferrous centrifugal castings are produced by the pioneer manufacturer of such equipment.

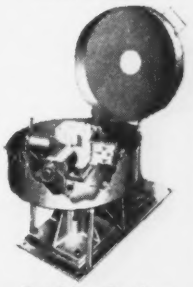
They are made in a large variety of styles and a wide range of sizes. Complete technical information is supplied concerning sand and permanent mold design, gating, sand mixes, speeds, etc.

Send us drawings or sketches of parts you are interested in casting centrifugally, and we will tell you, without obligation, if and how our machines can cast them faster, cleaner and with fewer rejects.


Vertical


Vertical Water-Cooled

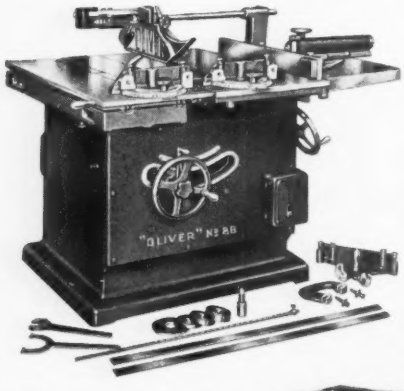

Horizontal Water-Cooled


Precision Casting

**CENTRIFUGAL CASTING MACHINE COMPANY**
P. O. Box 947 Tulsa 1, Okla.

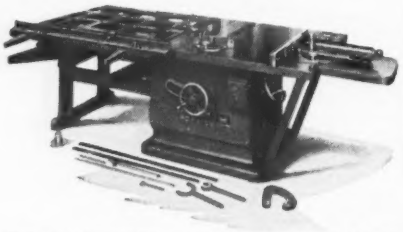

*Circle 732 on Inquiry Card—Page 217*

# Saw those large sections of patterns with ease on this OLIVER



The saw arbor tilts to any angle up to 45° permitting the operator to rip, cross-cut, miter or dado with ease on the large table. An 18-inch saw projects 4¾" through table having 4¼" vertical movement. Rips up to 50"; cross-cuts 48" x 1" thick. Has most accurate set of graduated gauges. Write for Bulletin No. 88-D.

- *Also made in 6 additional models with a variety of table extensions to handle extra large work.*
- *Write for details.*



**OLIVER MACHINERY COMPANY**
*Established 1890* **GRAND RAPIDS 2, MICH.**

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# EMPIRE
## "THAT GOOD" FOUNDRY COKE

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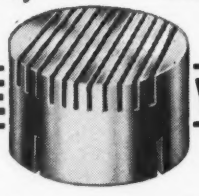
BE PREPARED TO HAVE
# BETTER CORES
*By Inserting*

SMILLIE  VENTS

FOR BLOWING CORES
Sizes from ⅛" to 1" in 1/16" steps Samples upon request

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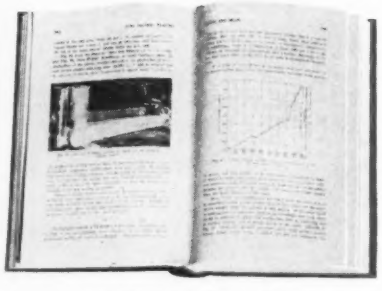
# STEEL FOUNDRY PRACTICE
By JOHN HOWE HALL



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**252 charts and illustrations**
**6" x 9" cloth bound**
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A new comprehensive sourcebook covering all phases of modern steel foundry practice. This book is the only up-to-date treatment of the subject available today.

*Steel Foundry Practice* contains practical information on almost every production problem steel foundrymen encounter. The easy-to-read text is accompanied by over 250 detailed charts, drawings and illustrations of the "how-to-do-it" type.

This volume represents the last of the many contributions which the late John Howe Hall made to the progress of the foundry industry.

Steel foundry personnel (from top executives to apprentices), educational institutions, technical libraries, suppliers to the steel foundry industry . . . all will benefit from the use of this book.

A complete cross index permits ready reference to any section. Many references relating to additional sources of information are provided. Use the coupon below to order your copies now.

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5. Flasks and Rigging
6. Centrifugal Casting
7. Shakeout, Cleaning and Welding
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**HOW TO USE THE CUPOLA**

**$1.00** Postpaid

**NEW 36 PAGE HANDBOOK**
by Bernard P. Mulcahy,
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**13 HELPFUL CHAPTERS ON ALL PHASES OF THE CUPOLA. "How To Use The Cupola" . . . . 13 idea-packed chapters based on the practical experience of a man who has devoted his life to foundry fuel and melting problems. It's a mighty useful handbook—a handy source of information which will pay for itself many times over in the months and years ahead.**

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**For Better Aluminum**

**AT LOWER COST**

**B&A**
**POTASSIUM**
**TITANIUM FLUORIDE**
($K_2TiF_6$)

**Many Advantages**

When making aluminum castings, the use of B&A Potassium Titanium Fluoride results in finer grain structure, with improved yield and tensile strength, greater elongation and better machinability . . . all leading to lower production costs, better products!

**Low-Cost Way of Adding Titanium**

The incorporation of titanium into aluminum alloys may be accomplished more economically with Potassium Titanium Fluoride than with other methods.

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Where temperatures are in the range of 1400°F, the Potassium Titanium Fluoride may be added straight or, if lower operating temperatures are employed, a mixture of this salt with Potassium Fluoborate, which has a lower melting point than straight Potassium Titanium Fluoride, may be used.

**And . . . Investigate B&A Alkali Fluoborates**

B&A Alkali Fluoborates are easily-handled purifying salts which the foundryman can use like precision tools for a wide range of purposes when casting magnesium, or when refining, melting or heat-treating aluminum.

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**For information on these high purity chemicals, call or write any of the Baker & Adamson offices listed below.**

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*Complete stocks carried here

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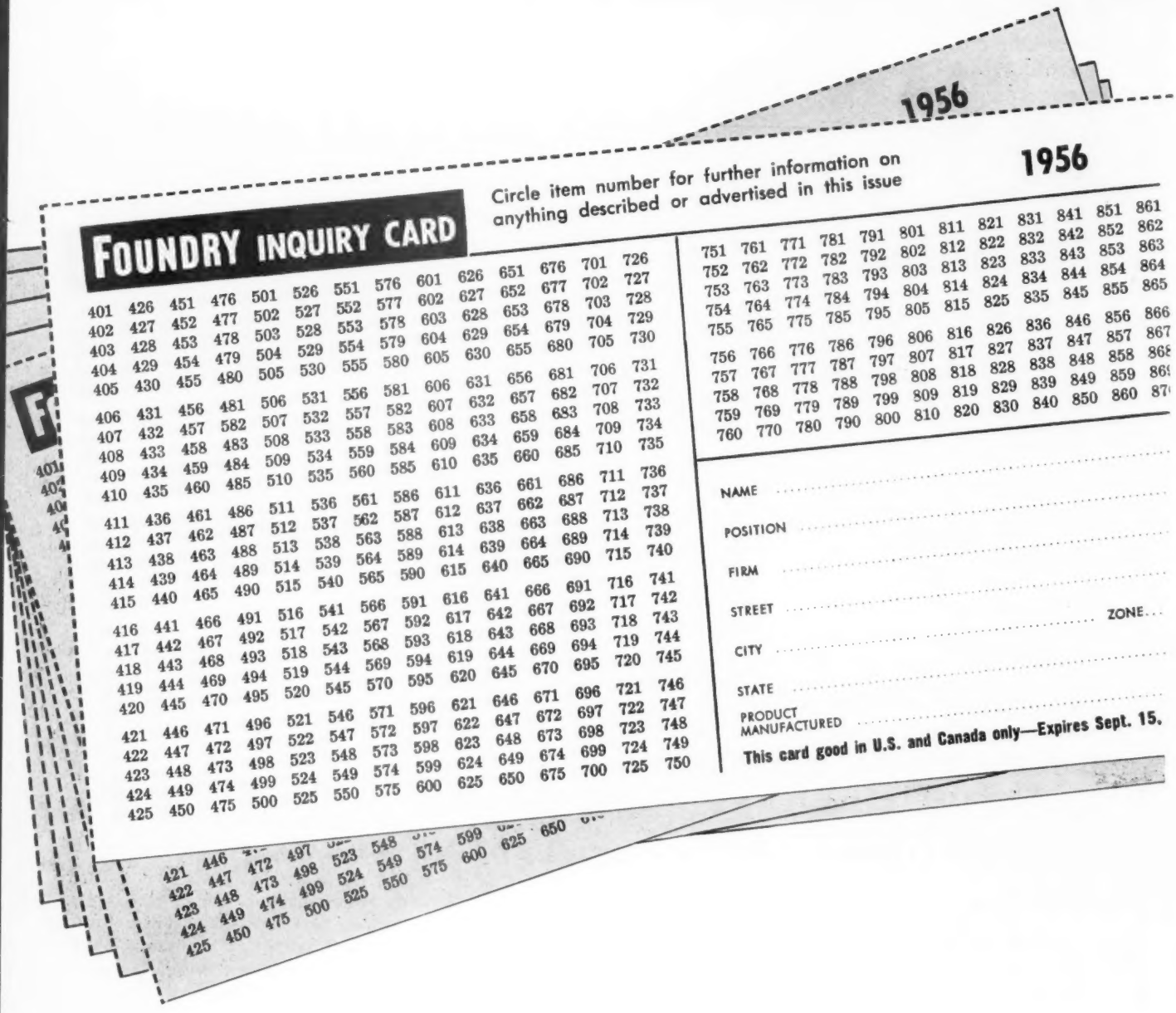


MORE FOUNDRYMEN are using these handy inquiry cards - - - - to get more information and literature on equipment, products and services described or advertised in FOUNDRY.

For your convenience - - - - Inquiry Cards will be found in this issue on page 217.

FOUNDRY

# CLASSIFIED ADVERTISING

## Help Wanted

**ASSISTANT CHIEF ENGINEER**

**MAGNESIUM FOUNDRY**

We are a well established medium sized Chicago Foundry with an expanding operation under an aggressive management group.

We would like to receive a brief resume from you if you would like to join the management team. You should have experience in the engineering of aircraft quality magnesium sand castings. You should also be able to handle liaison work with customers regarding casting design and quality control problems. Salary will depend upon experience.

All replies strictly confidential.

**BOX 368, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

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**FOUNDRY TECHNICIAN OR QUALITY CONTROL ENGINEERING ASSISTANT**

Mechanized gray iron foundry in Ohio producing quality engineering jobbing castings. Applicant should have some technical background, training or experience in one or more of the following fields—Metallurgy, Cupola Control, Sand Control, Gating and Risering.
This position will offer many opportunities in increasing efficiency and control of all foundry operations including practical research, development and application on new foundry processes such as shell process and $CO_2$ process. Earnings will be dependent on qualifications and ability.

**BOX 320, FOUNDRY**
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**FOUNDRY SUPERINTENDENT**

Must have several years of steel foundry experience. Will exercise supervisory and quality control over a new foundry producing molds, stools, and other castings for in-plant use. Excellent opportunity. Liberal salary and bonus. Please submit resume, including education, experience, and salary requirements.

**SUPERVISOR OF EMPLOYMENT**
**GRANITE CITY STEEL COMPANY**
**GRANITE CITY, ILLINOIS**

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**DESIGNERS-DRAFTSMEN-ENGINEERS**

Experienced in foundry layouts and equipment. Send experience record, personal data, recent photo and reference prior to personal interview.

**BOX 361, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

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**FOUNDRY SUPERINTENDENT**

To supervise molding, core and cleaning departments of one of the most progressive jobbing steel foundries in the Middle West; currently producing approximately 700 tons of steel castings per month. Must be familiar with heavy floor molding, roll-over machines and squeezers. Prefer age bracket 30 to 45. Should be a college graduate. Address: R. L. GILMORE, PRESIDENT, SUPERIOR STEEL & MALLEABLE CASTINGS CO., BENTON HARBOR, MICH.

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**ELECTRIC FURNACE MELTER WANTED**

By small jobbing foundry in the Pacific Northwest. Must be experienced in Acid Practice and capable of taking complete charge of melting department. Address: Box 362, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

## Help Wanted

**CHIEF METALLURGIST**

Chief metallurgist of executive caliber by long established large ferrous foundry in Chicago—Milwaukee area. Prefer man of medium age, grounded in ferrous castings with administrative potential. Compatible circumstances and good opportunity. State salary. Will consider confidential. Our employees know of this advertisement.

**BOX 387, FOUNDRY**
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**PATTERN SALES REPRESENTATIVE**

Modern, well-equipped and established pattern shop with A-1 rating in middle west, 75 miles from Ohio-Indiana and Kentucky lines. Need patternmaker with some foundry experience along with a practical and technical experience in wood and metal patternmaking to expand our sales force.
Should be able to quote pattern prices and handle customer relations in 150 mile area. Would consider training the right man. Salary open.
Please submit resume and salary expected. All replies kept confidential.

**BOX 325, FOUNDRY**
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**WANTED**

Young, alert college graduate. Prefer metallurgical training. For sales and executive training. Territory Westren Pennsylvania, West Virginia and Western New York.

**BOX 364, FOUNDRY**
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**ASSISTANT FOUNDRY SUPERINTENDENT**

Want modern, control-minded Assistant Superintendent for Midwest Malleable Foundry producing mechanized and semi-production jobbing castings. Must think ahead and participate in modernization program while improving quality and reducing costs. Real opportunity and challenge at adequate salary and bonus. Reply giving personal data and salary requirements.

**BOX 357, FOUNDRY**
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**FOUNDRY DEVELOPMENT ENGINEER**

Well established research organization in the gray iron castings field has an opening for a development engineer interested in application of results of research to plant practice. Engineering training with at least 3 to 5 years' plant experience highly desirable. Applicant should have an interest in the tecnnical aspects of all phases of foundry practice with principal interests in sands, gating and risering. Some traveling involved. Must have ability to write concise reports and exercise initiative in carrying out a project. In replying give educational background, foundry experience and brief biographical sketch. Address: Box 333, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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**PERMANENT MOLD DESIGN ENGINEER**

Must be capable of heading up department as well as designing molds. Address, HAMPDEN BRASS & ALUMINUM CO., 262 LIBERTY ST., SPRINGFIELD 1, MASS.

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**WANTED**

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## Help Wanted

**MAINTENANCE FOREMAN**

Experienced in foundry maintenance. Modern mechanized plant. Good working conditions. Pensions. Health and life insurance. Paid holidays and vacations. Please state experience, age and expected salary. Write to:

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**FOUNDRY MANAGER**

Man 35-45 thoroughly familiar with metallurgy and foundry practice for nonferrous foundry producing valves and similar components. Send photo and complete work history including compensation requirements.

**LESTER B. KNIGHT & ASSOCIATES, INC.**
**549 W. RANDOLPH STREET**
**CHICAGO 6, ILLINOIS**

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**METALLURGIST**

Well established malleable iron foundry in the East seeks experienced metallurgist. Please submit resume of qualifications and experience, references and salary expected.

**BOX 334, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

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**FOUNDRY ENGINEER**

Medium-size gray iron production jobbing foundry wants qualified young man for trouble shooting, estimating, gating and layout, as well as special projects working directly for chief executive. Challenging work and excellent opportunity for ambitious man. Furnish complete details including age, weight, height, experience, education, salary desired and references. Address: Box 380, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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**GRADUATE ENGINEER**

Or Metallurgist with some background in melting aluminum. Will be trained in special casting process to eventually take over operation of department. Excellent opportunity for man with leadership ability. Submit resume of education and experience, and state salary requirements. Address: Box 326, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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# CLASSIFIED ADVERTISING

## Help Wanted

**FOUNDRY SUPERINTENDENT**

Experienced man thoroughly familiar with metallurgy and foundry practice for nonferrous foundry producing valves and similar components. Age 35-45. Send photo and complete work history including compensation requirements.

**LESTER B. KNIGHT & ASSOCIATES, INC.**
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**DEVELOPMENT METALLURGIST**

For alloy development projects in the production of cast irons and cast or wrought nonferrous products. Engineering degree and five or more years' practical experience with operating equipment and processes. Capable to conduct systematic and constructive metallurgical investigations in melting, alloying and casting. Fine opportunity for seriously interested young metallurgist to gain valuable experience and to qualify for future promotion in progressive, nationally known corporation. Confidential.

**BOX 369, FOUNDRY**
**PENTON BLDG. CLEVELAND 13, OHIO**

**FOUNDRY SUPERINTENDENT**

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**BOX 335, FOUNDRY**
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By progressive and internationally reputable firm in Guelph, Ontario, to take control of laboratory operations including diagnosis and investigations in all forms of cast metals and responsibility for quality production of wide range of chemical preparations for the treatment of molten metals and molds. Applicant must have good practical metallurgical foundry experience in ferrous and nonferrous fields and be qualified in chemical analysis and metallography. Appointment carries excellent group insurance scheme and pension plan. Apply in writing with full details, qualifications and salary required. Address: Box 393, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOUNDRY FOREMAN**

For Los Angeles area, gray iron medium size jobbing and production casting operation. Give full particulars in letter including age, experience, education, salary requirements and references. Address: Box 385, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOUNDRY FOREMAN**

For Northern Ohio gray iron foundry employing 45 men on jobbing work. Opportunity for ambitious young man to supervise molding and coremaking. Send complete resume including age, weight, height, experience, salary desired, references, etc. Address: Box 332, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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For Northern Ohio Iron and Steel Foundry employing 200 men, jobbing foundry. Familiar with furnace, Morgan cranes, plant layout and production. Send complete resume including age, weight, height, experience, salary desired, references, etc. Address: Box 374, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOREMAN OR SUPERINTENDENT**

For SMALL SOIL PIPE FOUNDRY in Canada. Please state age, previous experience, remuneration desired and enclose snap shot of yourself. Address: Box 363, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

## Help Wanted

**FOUNDRY ASSISTANT**

To supervisor. Must be familiar with all phases of gray iron jobbing operations. Please state age, experience, education and other qualifications. Address: Box 375, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**STEEL MELTER**
**ELECTRIC FURNACE**

Foundry producing carbon low alloy and high alloy castings in East. Give particulars including experience and salary requirements. Address: Box 327, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**GRAY IRON FOREMAN**

Gray iron jobbing foundry near Cleveland needs a dry sand foreman for medium and large floor work. In reply give age, experience, references and include photograph. Address: Box 366, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOUNDRY MANAGER—PHILIPPINES**

Experienced all phases foundry operation to operate static and centrifugal soil pipe plant in Manila, Philippines. Send snapshot and full resume. Address: Box 365, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOUNDRY FOREMAN**

For Southeastern ductile iron, brass and aluminum foundry. Prefer between the ages of 25 through 40. Excellent opportunity. Send snapshot and full resume. Address: Box 388, FOUNDRY, Penton Bldg., Cleveland 13. Ohio.

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For metal pattern shop. Paid vacations and holidays. Steady employment. PROCESS PATTERN & ENGINEERING CO., INC., 1707 N. HARRISON ST., FORT WAYNE, INDIANA.

**FOUNDRY SUPERINTENDENT**

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## Positions Wanted

**SUPERINTENDENT**

Worked as molder, foreman, metallurgist, consultant and superintendent. Experience covers light and heavy castings, plain and alloyed gray iron, general jobbing and high production. Broad background of experience in gating, risering, cupola metal and sand control and costs. Have the ability and know how to produce quality castings at minimum costs and scrap. Want connection with sound reliable firm needing services of high grade foundryman that can demonstrate ability to produce results. Address: Box 394, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOUNDRY SUPERINTENDENT**

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumbers supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 370, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOUNDRY MANAGER**

With well rounded experience in all phases of gray iron foundry operations, both jobbing and production. Experienced as foreman, foundry engineer, sales representative, superintendent, and plant manager. Capable of controlling costs, production, quality, sales and organization. Complete resume upon request. Excellent recommendations. Address: Box 372, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOUNDRY SAND ENGINEER**

Fifteen years of foundry experience with nine years as a traveling service man. Presently employed with a large jobbing foundry. Like to relocate in the midwest area with a progressive company as a traveling sand control engineer. Will also consider sand control with a progressive gray iron, malleable or nonferrous foundry. Married, college graduate. Address: Box 353, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOREMAN**

Thorough knowledge of all phases of nonferrous metals. Green sand, skin dry or French sand, and tablet or false core molding. Thirty years' experience. Desire to make change. Address: Box 343, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

## Positions Wanted

**FOUNDRY SUPERINTENDENT**
**ENGINEER**

Graduate mechanical engineer, age 42, with eleven years' experience as Foundry Superintendent and Plant Manager of a small gray iron foundry and machine shop. Well versed in metal, sand control, molding, cores, production and engineering. Presently employed. Good employee relations. Best references. Desire connection with a larger company in either supervision or engineering. Complete resume upon request. Address: Box 383, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**MANAGER OR SUPERINTENDENT**

Have forty years' practical experience in foundry, molder for sixteen years. Have been foreman, superintendent and general manager. Was superintendent of three largest foundries in St. Louis, Missouri, largest one in Chicago, Illinois. Understand gray iron, semi-steel, brass, aluminum, rigging jobs to get best production at lowest cost, cupola, also mix of various metals; estimating jobs from blueprints. Can give best of references. Available immediately. Address: Box 389, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**FOUNDRY SUPERINTENDENT**

Thoroughly versed in all phases of ferrous and nonferrous foundry operations. Capable of producing efficiently and profitably. Address: Box 312, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**CORE ROOM FOREMAN**

Ten years' experience as foreman on medium and heavy jobbing, gray iron and steel. Desire job with future, married, age 38. Address: Box 377, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**SUPERINTENDENT**

Thirty years' experience, practical and technical, gray iron jobbing and production. Well versed all departments. Presently employed as superintendent. Address: Box 391, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**SUPERVISOR—METHODS—TIME STUDY**

Age 35, extensive industrial engineering experience. Eight years' foundry. Wish relocation with progressive firm. Thoroughly versed in incentives and production standards, methods analysis, work simplification, cost reduction projects, etc. Must be responsible position with complete backing of top management. Address: Box 376, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**WORKS MANAGER-SUPERINTENDENT**

Capable of operating a 350 man organization. 23 years of experience in casting ferrous and nonferrous metals in sand, permanent and investment molds profitably. Address: Box 319, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**WHAT HAVE YOU**

For a practical aluminum foundryman with good technical background in sand and permanent mold. Engineering, estimating, trouble shooting, liaison work with customers, some labor relations. Address: Box 352, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**CLEANING ROOM FOREMAN**

Twenty-five years' experience in all phases of this work. Ferrous and nonferrous castings. Free to locate anywhere. Address: Box 351, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**MANAGER**
**SUPERINTENDENT OR SALES**

Thoroughly experienced foundryman, gray, semi-steel, alloyed and ductile iron. Jobbing or production. Ability to handle any position. Age 45. Relocate. Available soon. Address: Box 354, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**MANAGER-SUPERINTENDENT**

Progressive, practical and technically trained foundryman, 45 years of age. Well versed in all phases of light to extra heavy ferrous jobbing work. Cost and control minded. Very good labor relations. Now employed. Address: Box 355, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**GRAY IRON FOUNDRYMAN**

Available, thorough and practical, green and dry sand molding, coremaking, melting, costs, customer contacts, consulting and advisory work. Good handler of men, along in years. Plenty of know-how. Address: Box 392, FOUNDRY, Penton Bldg., Cleveland 13 Ohio.

**FOREMAN PATTERNMAKER**

Canadian, 30 years' experience. Broad knowledge all types of work. Specialized nonferrous production equipment. Address: Box 358, FOUNDRY, Penton Bldg., Cleveland 13 Ohio.

**FOUNDRY SUPPLY SALESMAN**

Fifteen years' experience with nationally known company. Would like to make a change. Address: Box 397, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

# CLASSIFIED ADVERTISING

## Employment Service

**FOUNDRY PERSONNEL SPECIALISTS**

National Placement and Procurement of
**GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS**

Confidential Inquiries Invited
From Employers and Qualified Applicants.

For Fast Competent Assistance Contact
**DRAKE PERSONNEL, INC.** **HARRISON 7-8600**
**JOHN COPE, DIRECTOR** **220 SOUTH STATE ST., CHICAGO, ILL.**

## Representatives Wanted

**REPRESENTATIVES WANTED**
Manufacturers' Representatives or Dealers wanted. Territories now available for Reda Melting Furnace designed for ferrous or non-ferrous metals. Aggressive selling outlets calling on foundries desiered who want to handle profit making furnace on a commission basis. Write or call: FURNACE DIVISION, REDA PUMP COMPANY, BARTLESVILLE, OKLAHOMA.

**SALES REPRESENTATIVES**
Gray iron production castings, Pennsylvania, Ohio, Maryland, New York, Connecticut areas. Address: Box 395, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**SALES REPRESENTATIVES**
To handle foundry account selling copper, brass, bronze, aluminum and zinc alloy sand castings. Ohio and midwest territories open. Strictly commission but liberal if results good. Address: Box 360, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

## Representative Available

**AGENCY SEEKS TO REPRESENT**

Progressive sales agency, currently representing a malleable iron foundry seeks to represent exclusively a reliable production nonferrous metals foundry for New York (including New York City) and New Jersey.

**BOX 367, FOUNDRY**
**PENTON BLDG.** **CLEVELAND 13, OHIO**

## Foundry Consultant

**ELECTRIC FURNACE CONSULTANT**
**BASIC AND ACID PRACTICE**

Supervisor on electric furnaces for 35 years. Thorough knowledge of:
1. All kinds of plain carbon and alloy steel.
2. Analysis control.
3. High standard of physical properties.
4. Low Cost with high productivity.

**EUGENE H. WEAK** **2933 HIGHWAY AVE.**
**HIGHLAND, IND.** **PHONE: TEMPLE 8-1244**

**FOUNDRY CONSULTANT**
**Specializing in Aluminum Foundries**
**Sand and Permanent Mold**
We offer a complete service in every manufacturing phase—Design through Production.
**R. L. CROSS**
**980 IRONWOOD DRIVE**
**PHONE: Oriole 7-3056**
**MARNE, MICHIGAN**

## Opportunity

**PERMANENT MOLD METHOD AVAILABLE THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California,** has developed a Permanent Mold Method for ferrous and non-ferrous metals and invites inquiries from any country regarding this method and process.

**OPPORTUNITY**
Experienced foundry equipment and supply man willing to promote U.S. equipment or supplies for sale in United Kingdom or Europe. Can invest. Address: Box 350, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

## Wanted-To-Buy

**WANTED**

Osborn Roto-Lift Molding Machine Model No. 3161

**PEORIA MALLEABLE CASTINGS CO.**
**PEORIA, ILLINOIS**
**PHONE: 2-5401**

**WANTED**

Gray iron foundry located in Eastern Pennsylvania and presently operating.

**BOX 379, FOUNDRY**
**PENTON BLDG.** **CLEVELAND 13, OHIO**

**WANTED**

USED SAND MULLERS
URGENTLY NEEDED
ROLLER CONVEYORS

**BOX 373, FOUNDRY**
**PENTON BLDG.** **CLEVELAND 13, OHIO**

**URGENTLY NEEDED**
American Swing Tables, all sizes—American 27 x 36 Wheelabrators, bottom pour ladles, 2, 4½, 15 ton. Large jolt rollover molding machines. Address: Box 381, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**WANTED**
Melting furnaces, tilting type, gas and oil fired; Mullers: Simpson, Beardsley & Piper, Clearfield, all sizes. Prompt reply appreciated. Address: Box 382, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**MIXERS WANTED**
Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

**WANT TO BUY**
Interested in buying a small to medium-size foundry producing Niresist, Nihard and similar heat, corrosion and abrasion resistant castings. Please submit complete details in first letter in strict confidence. Address: Box 390, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

## Foundries For Sale

**FOR SALE**
**GRAY IRON FOUNDRY**
**East-Central Ohio**

Gray iron foundry suitable for cope and drag, squeezer, floor and bench molding. Gas core ovens. 72" cupola, 85,000 square feet on 10 acres. Property fenced. Buildings sprinklered. Plus labor area in agricultural community. Convenient rail facilities.

**Box 310, FOUNDRY**
**PENTON BLDG.** **CLEVELAND 13, OHIO**

**GRAY IRON, BRASS, AND ALUMINUM**
Small foundry located in fast growing market. Six ton daily capacity. Modern Equipment. Can be financed. Address: CLEMMONS MANAGEMENT, 4108 DENNIS HOUSTON 4, TEXAS. PHONE CAPITAL 3-4527.

## Foundries For Sale

**FOR SALE**
Only foundry in thriving city. In constant operation for over 50 years. Working inventory of all raw materials and supplies, large machine shop included. Backlog of orders, good steady customers. Will operate until sold, reason for selling, owners retiring, account age.
Will furnish complete information to anyone interested in investing $115,000 total price for all real estate, equipment and supplies.
**BOX 384, FOUNDRY**
**PENTON BLDG.** **CLEVELAND 13, OHIO**

**FOR SALE**
Gray iron 8 molder foundry, near Indianapolis. 42 inch cupola, gas fired core oven. One acre ground, well fenced. Established business showing good profit. Address: Box 371, FOUNDRY, Penton Bldg., Cleveland 13, O.

## For Sale

**FOR SALE**

100 Steel Bins, Size 21" Deep, 24" Wide, 38½" Long. Weight approx. 140 pounds each. Hook rings on 2 sides. Ideal for shipping castings ..... $1,200.00

**LARGE SIZE HINES ALUMINUM FLASKS** (for the lot) ..... $ 600.00
Hines Alum Flask with trunnion (pop-offs & handles)
36" x 36"
12" Drag
12" Cope
Single Pin
Hines Alum Flask with trunnion & Handles (pop-off)
34" x 47"
6" Drag
6" Cope
Single Pin
Hines Alum Flask with Handles (pop-offs)
6" Drag
6" Cope
Single Pin
24" x 48"
Hines Alum Flask,trunnion & Handles (pop-off)
28" x 28"
4" Drag
11" Cope
Single Pin
Hines Alum Flask with trunnion & Handles (pop-off)
42" x 42"
12" Drag
12" Cope
Single Pin

**UNUSED ALUM. MATCH PLATES FOR PILLOW BLOCKS** ..... $ 500.00
1 7/16 Base, 4 Patt. per 10 x 18 Plate
1 7/16 Cap., 10 Patt. per 14 x 20 Plate
1 3/16 Base, 6 Patt. per 12 x 18 Plate
1 3/16 Cap., 10 Patt. per 10 x 18 Plate
2 5/16 Base, 2 Patt. per 14 x 14 Plate
2 5/16 Cap., 2 Patt. per 10 x 18 Plate
1 15/16 Base, 4 Patt. per 13 x 21 Plate
1 15/16 Cap., 3 Patt. per 14 x 18 Plate

**PATTERN EQUIPMENT FOR A & B AND SOME C & D SHEAVES** .. $ 700.00
**WOOD FLASKS AND JACKETS** ..... $ 150.00
**1 DOUBLE END GRINDER OR BUFFER** ..... $ 100.00
2 42½" Dia., 6920 Capacity in steel Timken Worm Gear Controllers Air cooled Trunnion, Tea Pot Spout Receiving & Pouring Ladles Never Used, never have been lined. Made by Industrial Equipment Company. Serial 5246-F and 6539-F. Both for $1,500.00

**MEMPHIS CASTING WORKS**
**1006 OAKLAND AVENUE**
**MEMPHIS 1, TENNESSEE**

**FOR SALE**

**MOTORS—GENERATORS**
**TRANSFORMERS**

Unused — Rebuilt

WORLD'S LARGEST INVENTORY

**ELECTRIC EQUIPMENT COMPANY**
Phone Station Collect GLenwood 3-6783
P.O. Box 51—Rochester 1, New York

# GUARANTEED MACHINES AT LOWEST PRICES

**JOLT SQUEEZE STRIP MOLDING MACHINES**

213 SPO; 4½" jolt; 13" squeeze
2114 SPO—11" sq.
2136 SPO—13" sq.
720 U Osborn—11" sq.
International PKL—14 x 5½

**JOLT ROLLOVER MOLDING MACHINES**

Tabor—30" x 40"; 12" draw; shockless—1000# cap.
2047 Osborn; 18" x 24"; stationary
601 Osborn; 30" flask
602 Osborn; 36" flask
605 Osborn; 54" flask

**JOLT SQUEEZERS**

275 J Osborn; 16 x 20; 10" sq. cyl.
276 J Osborn; 17 x 26; 13" sq. cyl.
113 J SPO; 17 x 26; 13" sq. cyl.

**SPECIAL OF THE MONTH**

**MILWAUKEE JOLT SQUEEZERS—MODEL 103 10" SQ.—4½" JOLT DIA. $125.00 EACH**

**CORE BLOWERS**

Redford Core Blowers
#193 Osborn for medium cores
#94 Osborn—for large cores

**MATERIAL HANDLING EQUIPMENT**

Model HA Hough Payloader
Clark Fork Lift Truck—6000 lb. Gasoline
Clark Fork Lift Truck—5000 lb. Electric—with battery
Elwell Parker Fork Lift Truck—4000 lb. Gasoline
Clark Fork Lift Truck—4000 lb. Gasoline
Mercury Fork Lift Truck—2000 lb. Electric
Lewis - Shepard Platform Lift Trucks

**FURNACES**

2000 lb. Stroman—Tilting Hydraulic
2000 lb. Fisher—Aluminum
350 lb. Detroit Rocker Barrel—Complete

**CORE OVENS**

Dielectric—Model 900A and 1800A. Set up in your shop in operating condition. Less than one-half price.
Despatch Core Oven—Batch type—8' square complete with all controls.

**MISCELLANEOUS FOUNDRY EQUIPMENT**

U.S. 7½ HP 3 speed grinders; 28" wheel
Model S Screenerator—B & P
Climax Wire Straightener
Model AA American Sandcutter
Jib Cranes—2 ton capacity
Electric Hoists—2 ton capacity

***FOR THE BEST DEAL CALL***

**BALCHER**

**MACHINERY COMPANY**

**695 E. 152nd Street**
**Cleveland 10, Ohio**
**Telephone: GLenville 1-2474**

*Circle 856 on Inquiry Card—Page 217*

# For Sale

# For Sale

**DEMMLER CORE BLOWER**
**Model—104-E**
**For cores up to 350 pounds**

30" cylinder, 12" draw stroke. Equipped with one ton storage hopper, automatic feeder, and 30" universal blow plate. Cost new—$6,500. Used less than three months.

**SELLING PRICE $3,000**

**Call or Write:**

**Mr. R. R. Krelle**
**HILLS Mc CANNA COMPANY**
**3025 NORTH WESTERN AVE. CHICAGO 18, ILLINOIS**
**GRACELAND 2-1150**

**LIQUIDATING**
**VANDUZEN FOUNDRY**
**CINCINNATI, OHIO**

**These Good Items at Reasonable Prices:**

1 Johnston & Jennings #1020 Jolt Rollover
1 Davenport #28 SA Jolt Rollover Pattern Draw, 27 x 40 Table with air clamps
1 International Rollover-Portable
1 International Core Blower SB-13
3 Milwaukee Squeezers, stationary
2 International Squeezers, Portable
3 Osborn Squeezers 275-J Portable
1 Whiting Tumbling Barrel 36 x 72, motorized.
1 Tabor shockless jar, flask lift, 32 x 32
3 Snag Grinders A.C. and D.C.
1 Cupola Blower, Buffalo #8
2 Pouring Ladles 2000 lb. cap. geared
300 Aluminum core plates, 16x22—16x20—18x24
Steel Flasks 13x22 up to 26x31
Snap Flasks and Pop-off Flasks, all sizes.
1 American Wheelabrator Tumblast 15x20 Rubber lined, with Dust Collector
I-R Air Hoists never used, still in original crates 1 and 2 ton
1 Wilson Hardness Tester
35—Steel corrugated, collapsible, stacking type boxes, 34 x 50 x 25 deep.
Magnesium buckets for elevators, never used.
Belting from 12" to 24", never used.
Air hammers, grinders, rammers.

**Many other items in stock**
**Send us your inquiries**
**We Buy — Sell — Trade**

**HOMAN MACHINERY COMPANY**
**824 REEDY ST.,**
**CINCINNATI 2, OHIO**
**MAin 1-4634**

**FOR SALE**

**TURBO BLOWERS WITH MOTORS**

| CFM | PRESS. | MAKE | CFM | PRESS. | MAKE |
|---|---|---|---|---|---|
| 12300 | 24oz. | Spencer | | | |
| 8375 | 20oz. | Spencer | 380 | 16oz. | No.Am. |
| 6000 | 32oz. | Ing.-Rand | 340 | 20oz. | A-B |
| 4700 | 32oz. | Ing.-Rand | 320 | 12oz. | Spencer |
| 2500 | 7oz. | Sturt. | 9000 | 6"SP | Northern |
| 1300 | 16oz. | Spencer | 3420 | 8"SP | N.Y. |
| 800 | 13oz. | Buffalo | 2700 | ⅝"SP | Ilg |
| 400 | 12oz. | Buffalo | 2500 | ½"SP | American |
| 450 | 7oz. | Spencer | 1100 | 4½"SP | Bayley |
| 400 | 16oz. | No.Am. | 2344 | 2"SP | Clarage |

**THE MOTOR REPAIR & MFG. CO.**
**1552 HAMILTON AVE.**
**CLEVELAND 14, OHIO**

**FOR SALE**

3 ft. x 2 ft. Simplicity Shaker
2 ft. x 4 ft. Simplicity Shaker
2 ft. x 5 ft. Simplicity Shaker
1—Eriez Magnetic Pulley 12 x 24"
1—Bondactor

**GREAT LAKES PIPE COMPANY**
**7286 W. GRAND RIVER**
**BRIGHTON, MICHIGAN**

**FOR SALE**

Two Clark Utilitrucs. 1947 models with 42" forks. 6000 lbs. capacity. Good condition. $1,500 each.

**GENERAL FOUNDRY & MFG. CO.**
**P. O. BOX 7037**
**FLINT, MICHIGAN**

**FURNACES FOR SALE**

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

**FOR SALE**

MOLDING MACHINES
1—Tabor 22" Power Jolt, Rollover, Draw. Portable, 22" x 32" Table.
1—Milwaukee jolt-squeeze stationary.
1—Herman, Jolt, Rollover Draw, 6000#, 40" x 60" table.
2—International Jolt, Rollover Draw, 24" x 10G, Stationary.
2—No. 275 Osborn jolt squeezers. Stationary.
2—SPO Jolt Squeeze strip—13"

CORE OVENS
1—Coleman Recirculating 4 section with 5 drawers per section. Gas fired.

BLOWERS FOR CUPOLAS AND FURNACES
1—Connersville Rotary Blower, 6000 CFM.
1—Connersville Rotary Blower, 3500 CFM.
2—#7½ Roots Rotary Blowers—27 x 81—14000 CFM.
2—Connersville Rotary 14" x 27" HD, 2750 CFM at 5# press.
Maxon-Premix Blowers for Gas ¼ to 1 HP.
2—2 HP 20 oz. Spencer Turbine Blowers.
1—Spencer Turbine Blower, 2700 CFM, 27 oz., 30 HP, 3/60/220-440 V.

METAL MELTING EQUIPMENT
1—1000# open flame brass melting furnace, gas fired.
1—Hausfeld tilting crucible, gas fired, 500# brass.
1—Hausfeld Stationary Brass, oil or gas burner. 200# cap.
1—Hausfeld Tilting crucible, gas 250# A1, Cap.
1—Hausfeld 2000# aluminum capacity furnace barrel type, open flame, oil fired.
1—#2 U.S. rotary melting furnace, 500# brass

MISCELLANEOUS
2—Hydro-Blast barrels with 25 HP pumps.
3—Jib cranes, 16' swinging beam, 2000# cap.
1—International SB-11 core blower.
2—Pangborn cloth screen collectors, 2 HP.
1—Stoney crane type shakeout.
1—Combs Riddle
1—30" Band Saw
1—NDP Royer sand separator.
1—#16 Roto-clone unit complete.
Complete stock of rebuilt mill and dust exhaust blowers.

**CLIFTON MACHINERY COMPANY**
**1023 W. SIXTH ST. CINCINNATI 3, OHIO**

**FOR SALE**

**Immediate Delivery**

1 — Coleman double compartment rack type core oven each 10 ft. x 5 ft. x 6 ft. with double straight lift doors. Single recirculating heater.

Complete control equipment.

1—No. 2 unit drive Simpson mixer with motor and starter.

**DETROIT FOUNDRY MACHINERY COMPANY**
**2008 PENOBSCOT BUILDING**
**DETROIT 26, MICHIGAN**
**PHONE: WOODWARD 3-8442**

# For Sale

**FOR SALE**

We have the best selection of HARD CHROME REBUILT PNEUMATIC TOOLS WE HAVE EVER HAD.

Ingersoll-Rand Size 24 Floor Rammers
Ingersoll-Rand Size 14 Bench Rammers
Cleco Bench Rammers
Chipping Hammers—All types
Core Breakers and Grinders

Our prices are about half the cost of new tools. All tools sold by us are guaranteed and can be returned if found not satisfactory.

**Repair and Rebuilding Service on all Pneumatic Tools**

**CENTRAL PNEUMATIC SERVICE COMPANY**
**512 LINDEN AVE., DAYTON, OHIO**
**TELEPHONE: MADISON 2701**

**FOR SALE**

One completely Automatic Sludge Ejector Tank, Model #26CV. LIKE NEW. Can be adapted to a washer type dust collecting system to permit re-circulation of water. Manufactured by the Whiting Corporation, Harvey, Ill. Has been used for experimental purposes only. Address: **DI-NOC CHEMICAL ARTS, INC., 1700 LONDON ROAD, CLEVELAND 13, OHIO.**

**FOR SALE**

One Taccone pressure molding machine for 12 x 18 flask with 50 sets steel flasks built for machine. Address: ARTHUR HARRIS & CO., 210 N. ABERDEEN ST., CHICAGO 7, ILLINOIS.

# For Sale

**SURPLUS EQUIPMENT FOR SALE**

| | |
|---|---|
| Whiting #3½ Cupola and Blower | $500.00 |
| 4000# Howe Platform Scale | 125.00 |
| 50—Slip and Snap Flasks | $10.00 & 15.00 ea. |
| 5—Haynes Molding Machines | 100.00 ea. |
| 2—2000# Geared Ladles | 50.00 ea. |
| 1—2000# 20' Jib Crane W/trolley | 100.00 |
| 1—Safety Sefing Grinder | 350.00 |

**CONWAY FOUNDRY COMPANY**
**7937 WEST LAFEYETTE**
**DETROIT 9, MICHIGAN**

**FOR SALE**

Four Osborn Model 2047-3 Rollover jolt molding machines, serial #10867-BN. Core box 21¼ x 22¼. flask space 11⅛", pattern draw 8". Never used.

**TRIPLEX MACHINE TOOL CORP.**
**75 WEST STREET**
**NEW YORK 6, NEW YORK**

**FOR SALE**

25,000 lbs. of first line foundry blacking. Available in 400 lb. barrels at 4c lb. f.o.b. Charleston, S. C. This blacking was purchased as government surplus and is excess to the needs of our foundry.

**MIDGETT FOUNDRY COMPANY**
**P.O. BOX 4056**
**CHARLESTON HTS., S. C.**

**FOR SALE**
**NEVER USED**

#5D Milwaukee-Taccone Core Blower. Never used—due to change in methods. Will sell reasonably.

**THAYER-PARADINE CORPORATION**
**1014 W. 12TH ST.**
**ERIE, PA.**
**PHONE: 24-890**

**FOR SALE**

Slightly used Allis-Chalmers 5 KW Foundromatic Dielectric Core Dryer. Address: EMPIRE PATTERN & FOUNDRY COMPANY, P.O. BOX 1647, TULSA, OKLAHOMA. B. R. KINCADE.

# For Sale

**FOR SALE**

**All machinery sold as "Rebuilt" that does not prove satisfactory be returned, "freight prepaid" within 30 days, for full price refund.**

| | |
|---|---|
| 15" Continuous Wheelabrator Tumblast | $2,000. |
| 36" Continuous Wheelabrator Tumblast, like new | 9,000. |
| 48 x 48 Wheelabrator Tumblast | 5,000. |
| 42 x 48 Wheelabrator Tumblast | 3,000. |
| 36 x 42 Wheelabrator Tumblast | 2,500. |
| 27 x 36 Wheelabrator Tumblast, rbr. or stl. belt | 3,000. |
| 8' Wheelabrator Table Blast | 2,000. |
| 8' Pangborn Table Blast | 2,500. |
| 14 GK 2 Pangborn Rocker Barrel | 2,000. |
| Pangborn E.S. 347 Conveyor Cabinet, 4 throwing wheels, used for blasting motor blocks or heads | 9,000. |
| Vapor Blast, cabinets, single | 500. |
| Vapor Blast, cabinets, double | 900. |

All types and sizes of Hand cabinets, Dust collectors, Pressure tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional sand blast equipment too numerous to mention.

**PHONE OR WRITE**
**DIAMOND SALES, INC.**
**5654 W. JEFFERSON**
**DETROIT 9, MICHIGAN**
**PHONE: VI 36750**

**WE WILL BUY ONE PIECE OR YOUR ENTIRE PLANT**

**FOR SALE**

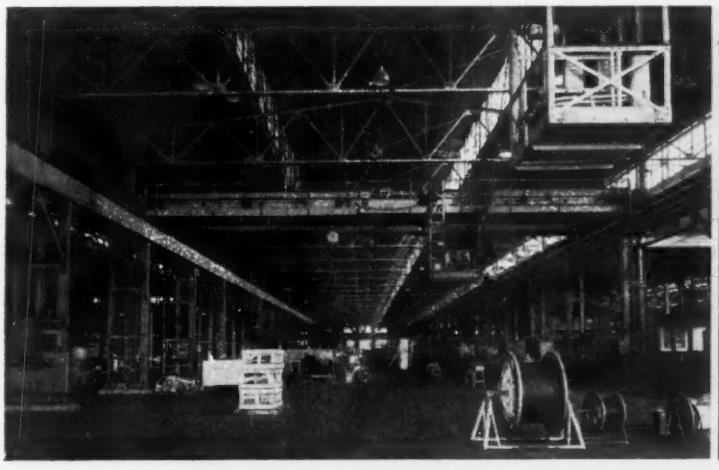
1—Simpson Mixer, #2, 20 HP motor.
Miscellaneous: Screens, Pulverizers, Grinders, Tyler Rotap Screens etc.
Wanted: Your Idle Machinery.

OUR 39th YEAR

**CONSOLIDATED PRODUCTS CO., INC.**
**66 BLOOMFIELD STREET**
**HOBOKEN, NEW JERSEY**
**HO 3-4425 N. Y. TEL. BA. 7-0600**

**MOLDING MACHINE**

Herman 6000# cap. jolt-roll-draw in operating condition. $2900 f.o.b. POTTSTOWN MACHINE CO., POTTSTOWN, PA., (H. H. Houston). 15% to any established dealer.



**FOR SALE...**

**129**

**OVERHEAD**

**CRANES**

**Immediately Available**

## 3 TON TO 150 TON CAPACITY—37'2" TO 90 FT. SPAN

| QUANTITY | DESCRIPTION | SPAN |
|---|---|---|
| 1 | 150 ton | 74'-3" |
| 4 | 100 ton | 74'-3" |
| 3 | 70 ton | 74'-3" |
| 3 | 50 ton | 74'-8" |
| 8 | 40 ton | 56'-0"; 66'; 76' |
| 2 | 25 ton | 62'-0" |
| 3 | 20 ton | 56'-0" |
| 8 | 15 ton | 62'; 71'; 76'-9" |
| 4 | 12 ton | 56'-0" |
| 85 | 10 ton | 37'-2"; 56' |
| 2 | 7½ ton | 56'-0" |
| 5 | 5 ton | 23'; 56'; 47'-3"; 90' |
| 1 | 3 ton | 31" |

**These cranes are cab operated, 230 volt D.C. operation. Several of these cranes have two trolleys and auxiliary hooks. D.C. generating equipment for the operation of these cranes is also available.**

***Detailed Engineering data is available upon request***
***Location: Eddystone, Pa. (Phila. Suburb)***

**LURIA BROTHERS & COMPANY, INC.**
**PHILADELPHIA NATIONAL BANK BUILDING**
**Philadelphia 7, Pa.** **Rittenhouse 6-7455**

# THE ACME BARGAIN PAGE

**AIR COMPRESSORS**
Ingersoll Rand Type 10, 800 CFM, 2 stage air compressor, 200 HP, 220 V motor. Rebuilt 1952.

**BLOWERS**
Ingersoll-Rand Type FS. Single Stage 4000 CFM @ 3.75 PSI, 100 HP, 220V G. E. Induction motor.
General Electric 7500 CFM, 20 oz., 89.6 Max. HP, 220V motor, Airway controls.
Ingersoll-Rand turbo compressor 10500 CFM @ 20 oz. 85 HP G. E. 220V 3500 CFM motor.
1—Whiting-Allis Chalmers Turbo. 5750 CFM 28 oz. 60 HP 440V air pressure.

**CASTING SORTING CONVEYOR**
42″ x 260′ Link Belt

**CONVEYORS, VIBRATING**
Os-A-Veyor 2-24″ x 24′ section with 6′ grizzley
36″ x 162′ Oscillating Pan Link Belt
30″ x 53′ Oscillating Pan Link Belt

**CORE BLOWERS**
3—International SB 12.
4—International SB 13.
10—Osborn 193.
1—Osborn 2035-2.
1—Champion CB 400.
2—CB 10 Late Type.

**CORE GRINDERS**
4—Milwaukee 70-9.

**CORE OVEN VERTICAL HORIZONTAL**
1—Coleman, combination oil or gas fired 43 carriers 24″ x 90″—1 hour 12 min. to 4 hours 48 min. cycle.
1—Coleman, combination oil or gas fired 43—2 shelf carriers 30″ x 144″ long. 2 hour 12 min. to 7 hour 24 min. cycle. Present replacement cost over $90,000.

**CORE PASTE OVENS**
2—Coleman Gas Fired 28′-25″ x 42″ opening.

**DUST COLLECTORS**
Rotoclone 24W, 30 HP.

**ELECTRIC MELTING FURNACES**
Detroit Electric 1500#—Kuhlman 13200 volt transformer complete with controls.
Detroit Electric 350#—Kuhlman 13200 volt transformer and controls.

**FURNACE TRANSFORMERS**
We have Electric Furnace Transformers in stock from 800 KVA to 2500 KVA. Write us your needs.

**GRINDERS**
**Double End Disc:**
1—U.S. 18″ wheels, 2 swing tables.

**GRINDERS, SNAGGING**
2—Hammond 10 WRI D. E. Snag. 20″ dia. wheels, 10 HP 220/440 v motors, variable speed drives.
1—3″ x 24″ U.S. #65, 20 HP 220/440V.

**GRINDERS, SWING FRAME**
2—3″ x 24″ x 12″ Fox #4, 15 HP.
1—3″ x 24″ x 12″ Marschke, 20 HP.
1—3″x24″x12″ U.S. 15 HP.

**HOT METAL CARRIERS**
3—1 ton D.C. Cab operated Cleveland, Monotractor Hot Metal Carriers.

**MOLD CONVEYORS**
2—Link Belt Tru-Trac, 88—20″ x 4′ cars, cooling hoods, stack fans

**MOLDING MACHINES**
**Jolt Squeezers:**
5—Milwaukee 103-11 Staty. Jolt Squeezers, 13½″ x 20″ table.
7—Champion JS10P Portable Jolt Squeeze molding machine, 18″ x 21″ table.
4—Osborn 275J.
**Jolt Squeeze Pin Lifts**
2—Milwaukee Jolt Squeeze Strippers, Model 163-50, 15″ x 24″ table 16″ X open end pattern size.
1—#165 Milwaukee.
10—712 PJ Osborn

**ROLLOVERS**
1—Herman 4000# Series 30″ x 60″ table.
1—Herman 3000# Series 40″ x 84″ table, special slotted table.
1—Herman 1500# Series 20″ x 36″ table.
2—Herman 750# Series 20″ x 30″ table.
2—Herman 750# Series 20″ x 24″ table.
3—Spo Model 9032.
1—Milwaukee 217.
2—International Type G, Portable, 20″ x 8″ draw.
3—Tabor Portable Rollover 30″.
Johnston & Jennings 1020-44 x 44 max. Flask Size.

**PIN LIFT PUSHOFFS**
1—Champion Pin Pushoffs 28″ x 42″ table 10″ draw.

**MULLERS**
Simpson 1 H
Simpson #2 Unit drive
2—Simpson #3UD, time cycle controls, dust hoods, water meters, cooling.

**OVENS, CORE**
Despatch Type S, 2 cars 27½ x 54 x 64, Gas Fired.

**OVERHEAD TROLLEY CONVEYORS**
5000′ Jervis B. Webb & Link Belt 658 chain, 4 D.C. motor drive and MG set.

**POURING DEVICES**
3—Pouring devices, Whiting 500#.

**ROTOBLAST**
Pangborn 6′ dia. 6LF14 with dust collector

**SAND CONVEYORS**
144′-30″ Flat with Drives.
47′-30″ Trough with Drives.
2—Simplicity Os-A-Veyor 24″ x 24′.

**SHAKEOUTS**
Link Belt 5′ x 10′—7½ HP motor

**TUMBLING BARRELS**
3—Royersford 42′ x 72′ Roller Bearing, Chain Drive.
1—Sly Square 42 x 42 x 64.
1—Sly 42″ Dia. x 56″.

**WIRE STRAIGHTENERS**
American Model D Rod Straightener
Climax 2A

**WHEELABRATORS**
1—27″ x 36″ Rubber Belt Wheelabrator
48″ x 42″ American, bucket loader

ACME

**ACME EQUIPMENT CO., INC.**
*We will buy for cash a single piece of equipment or your entire plant*
**126 South Clinton Street • Phone: ANdover 3-3430 • Chicago 6, Illinois**

MONA

## Announcing an outstanding foundry equipment

# SALE

**Unused: Three 78″ cupolas with accessories**
**( Whiting No. 8, Model B )**

*Priced well below market value . . . for immediate sale*

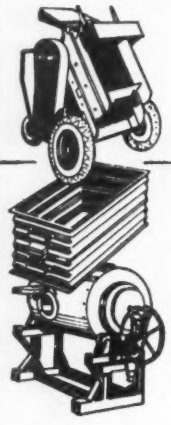
**Special to foundry operators: If you have plans for expansion or plan to replace worn-out equipment, act now on this outstanding opportunity. Phone or wire to arrange for inspection. Dealer inquiries invited.**

**Contact:** **H. W. Christensen**
**120 Montgomery Street**
**Columbia-Geneva Steel Division**
**United States Steel Corporation**
**San Francisco 6—Phone SUtter 1-2500**

*Description of unused equipment for sale:*

| QUANTITY | ITEM | QUANTITY | ITEM |
|---|---|---|---|
| 3 EACH | Whiting No. 8 Model B Cupolas having a shell diameter of 78″ and to be lined to 60″. Also equipped with refractory lined iron runners, cast iron wishbones for use in charging, and bottom door lifting devices. | 2 EACH | Motor driven desulphurizing ladles, "U" type, 44″x126″, 40 ton capacity complete with covers, refractory lining, gears, gear guards, and bearing stands except that 1 bearing cap, 2 Hyatt bearings and 10 large bolts are excluded. Also excluded are exhauster fans and driving units. However, one drive unit base and gas preheaters are included. |
| 3 EACH | Drop bottom charging buckets 48″ I.D. by 48″. | | |
| 3 EACH | Foundry Whiting Allis-Chalmers cupola blowers rated to deliver 7100 cfm at 24 oz. and at 5,000 feet altitude. Normal rating at sea level 8,600 cfm at 32 oz. Complete with electric motors. | 2 EACH | Whiting standard hoods and 24″ I.D. stacks including piping jib supports for location over desulphurizing ladles. |
| 3 EACH | Standard Whiting 42″ top diameter slagging ladles complete with trunnions, spur geared tilting mechanism, and standard truck for 30″ gage track. Also included are one additional ladle complete except for wheels and axles, and one spare ladle only. | 1 EACH | Batch weigh hopper for metal to use in making up cupola charges complete with air operated cylinder for opening during discharge. Also equipped with Fairbanks Morse scale and platforms. |

Location of equipment: Geneva Works, Provo, Utah
Columbia-Geneva Steel Division · United States Steel Corporation



# EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD CLEVELAND 10, OHIO

## SAND DISTRIBUTING CONVEYOR . . . 18 STATIONS . . . SHAKEOUT AND SAND CONVEYOR . . . VIBRA SCREEN . . . PUG MILL BUCKET ELEVATOR.

## CALL NOW! SEE IN OPERATION

## GLenville 1-1222

### GRINDING EQUIPMENT

1—#6 Gardner double end disc, 24" wheels.
1—#230 Gardner double end disc, 30" wheels, V-belt.
1—#6 Cheesley disc, 18" wheel, dir. conn.
2—5 H.P. Safety Emery Wheel Co., 18" x 3" wheels, 220/440/3/60.
2—7½ H.P. Marschke and Universal, double end, 220/440/3/60.
2—10" double end Marschke, 220/440/3/60.
1—10 H.P. Mummert-Dixon swing grinder, 220/440/3/60.
1—Lot small grinders and chippers, various makes.
2—Milwaukee Core Grinders, 70" dia.
2—15 H.P. Safety, double end.

### CUPOLA BLOWERS

1—Spencer Turbine 50 H.P. 6750 CFM 16 oz., 220/440/3/60.
1—Piqua, 5000 CFM 16 oz., 220/3/60.
1—North American, 20 oz., 4500 CFM.
1—Size 9 Sturtevant w/75 H.P. 220/440/-3/60 motor.
1—Roots-Connersville 9000 CFM.

### CORE BLOWERS

**Champion**
1—CB10 weight of core up to 12 lbs.
**Demmler**
1—#50 weight of core up to 6 lbs.
2—#2 weight of core up to 20 lbs.
1—#2K weight of core up to 20 lbs.
1—#3 weight of core up to 35 lbs.
2—#4 weight of core up to 100 lbs.
1—#3E weight of core up to 35 lbs.
1—#4E weight of core up to 100 lbs.
**International**
1—SB11 weight of core up to 12 lbs.
1—SB13 weight of core up to 35 lbs.
**Redford**
1—Bench Type, #1, core up to 2 lbs.
**Osborn**
2—#91 up to 15 lbs. cores.
1—#93 up to 50 lbs. cores.
1—#193 up to 75 lbs. cores, 10" draw.

### MISCELLANEOUS FOUNDRY EQUIPMENT

5—GIB Cranes 6" to 9" I beams.
2—Pangborn Sand Blast Cabinets—EN2, EN13.
2—#3 Jeffrey Electric Vibrators.
4—#4 Jeffrey Electric Vibrators.
1—Core Breaker drums, 6'x10'.
1—#3½ Modern Cupola.
1—#7 Whiting.
1—300A. Westinghouse Arc Welder, 220/3/60.
1—Lot of Hines Popoff flasks, steel flasks—ask for listing.
1—Lot of Air chipping hammers, air rammers.
1—Clamshell bucket 1 Yard Blaw-Knox.
1—20" Combs Gyratory Sand Riddle—Electric.
2—24" Combs Gyratory Sand Riddles—CR.
1—Hough Payloader, Model HA.
1—Riehle Tensile Strength Testing Machine, 100,000 lbs. capacity.
Shot Blast Equipment: Pangborn type MTS Cabinet with Table and Pangborn Type EN-2 Cabinet.
Molding Machines: Squeezers, also 4—#405 Osborn Rollovers and 3—#2047 Osborn Rollovers.
Core Oven: 2-Door Despatch—Gas Fired with Controls 2—400 Ton Kux Zinc Die Casting Machines . . . Saws—Grinders—Welders.

## We Buy and Sell One Piece of Equipment or Complete Foundries—Everything Guaranteed

### CORE OVEN

1—Steiner Ives Co., gas fired, recirculating, Wheelco Controls, 88" wide x 48" deep, 7' high, 4 horizontal counterweight doors.

### ANNEALING FURNACE

Loftus Engineering, Pusher type, gas fired, recirculating complete with all controls overall dimensions: 45' lg. x 10' wide x 12' high

### TUMBLING MILL:

60" x 72" Ransohoff tumbling type wet cleaning mill, Serial No. 6318, drive 15 HP. bucket loader 5 HP 3/60/220

### MAGNESIUM CLEANING CABINETS:

7—Whirlpool Duplex, 800 CFM, 100" wide x 65" deep x 90" high. Buffalo exhausters—7½ HP., 220/440

### MOLDING MACHINE SPECIALS

**OSBORN**

**Rollovers:**
1—Model 405-95, 40"x60" table, 26" draw, 3500 lbs.
2—Model 602, 24"x36" flask, 10" draw.
6—Model 601-13, 24"x30" flask, 10" draw.
8—Model 2047-4, 8" draw, adj. air clamps.
1—Model 422, 9" draw, 26"x36" flask.
4—Model 242, 12" to 19" draw, 24"x54" flask.
1—Model 342, 12" to 19" draw, 24"x54" flask.
1—Model 36 core draw, 6" lift, cap 100#.
1—Pushoff, 3'x16' table.
1—2042 Rollover and Draw.
**Rockover and Draw**
1—147-1, air clamps 8" draw, 40"x24" core box.
**Jolt Squeeze Pin Lift**
4—814-P, 700 lbs. joint, 8" draw, 14" squeeze cylinder.
5—720U, 600 lbs. jolt, 4" draw, 11" squeeze cylinder.
2—724 PJ, 24" cyl., 11" jolt cyl. table, 10" draw.
**Joint Pin Lift**
2—559 Portable 25"x30" table, 1200# jolt, 6" draw.

**INTERNATIONAL**

**Rollover**
2—Type G, 1000# capacity, 10" draw, size 24"x10".
6—Type RJ air jolt, hand rollover, size 20"x8".
4—Type R hand ram, hand rollover, size 20"x8".
1—Type PK-10 Jolt Squeeze Pin Lift, 10" squeeze cyl., 8" lift.
1—Type J, 76"x76" table, 10,000 lb. cap., plain jolt.
1—Type J, 18"x18" table, 700 lb. cap., plain jolt.

**NICHOLS**

**Jolt Squeeze Strippers:**
2—Model 24-54D, 24" squeeze piston, 1600 lbs. jolt, 8" draw.
**Jolt, Frame Strip:**
4—Model 16-JS, 16" jolt cyl., 12" draw, 2-8" draw cyls.

**MILWAUKEE**

**Jolt Squeeze Strip**
1—163-65, 15" x 24" table, 8" draw, 16" squeeze cyl.
**Jolt Pin Lift**
1—62OND2 Frame Strip Pushoff, 2000 lb. capacity.
2—900 lbs. jolt, pin lift, 6" draw, 17" x 21" table.

**TABOR**

**Rollovers**
1—22" x 42" table, 10" draw, 600# cap., air clamps.
2—22" x 32" table, 10" draw, 600# cap., air clamps.
2—Plain jolt B-4, 18" x 24" table, 700# capacity.
3—Plain jolt B-3, 12"x 14" table, 300# capacity.

**SPO**

**Jolt Squeeze Rollover and Draw**
1—917—750# jolt, 17,000# squeeze cap., 9" draw.
**Jolt Squeeze Pin Lift**
2—2136, 800# jolt, 10,000# squeeze, 6" draw.
3—2166, 1500# jolt, 16,000# squeeze, 6" draw.
**Jolt Pin Lift**
3—3070, 1500# jolt, 10" draw, 26" x 35" table.
2—307, 1500# jolt, 8" draw, 25" x 30" table.
**Jolt Rockover and Draw Stationary**
2—508, 28" x 30" table, 1200# jolt, 9" draw.

**DAVENPORT**

**Rollovers:**
1—Model SA40, 18" draw, 3000# cap., 40" x 60" table.
7—Model SA28, 12" draw, 1500# cap., 30" x 40" table.

**JOHNSTON & JENNINGS**

**Rollovers:**
1—Model 612, 24" x 30" table, 600 lbs. cap. 12" draw.
5—Model 918, 44" x 54" table, 2000 lbs. cap., 18" draw.
2—610RP table size 24" x 30", 10" draw, 600# jolt.
4—815 table size, 30" x 40", 15" draw, 1200# jolt.
**Jolt Pin Lift**
1—1216—36" x 54" table, 3000 lbs. jolt, 16" draw.

### BLAST CLEANING EQUIPMENT

1—American Wheelabrator, 48" x 48" with Skip Hoist Bucket Loader.
1—American Wheelabrator, 48" x 42" with Skip Bucket Loader.
2—Pangborn Blast Barrels, #2-GF.

**FOR SALE NOW:** In Bellville, Ohio, 10 miles south of Mansfield a complete Gray Iron Foundry with No. 7 Whiting Cupola, 18,000 sq. ft., with railroad siding.

We would like to offer a sincere thank you to the finest people we know . . . our customers . . . for their friendship and kind patronage during this past year.

May your Holiday Season be warm and happy and may good fortune shine upon you throughout the New Year.

Universal Machinery & Equipment Co.
Reading, Penna.

# AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

## AIR COMPRESSORS

1—CHICAGO PNEUMATIC 8 x 7 Single Stage Horizontal, 160 CFM, 30 HP.
1—SULLIVAN WG-8 Size 7 x 7, 152 CFM, 20 HP, Horizontal.
1—SULLIVAN Model WG-9 Vertical, Size 8 x 7, 40 HP, 232 CFM, after cooler.
1—CHICAGO-PNEUMATIC Size 7½ x 6 Single Stage Horizontal 20 HP Motor.
2—GARDNER-DENVER Model ADR 4" Stroke, 15 HP Motor.
1—SULLIVAN WN-3 Size 20 x 12 x 14", 1220 CFM, 250 HP AC Motor.

## AIR HOISTS

10—INGERSOLL-RAND Size, C 2000 lb.
75—INGERSOLL RAND RC-5, 500 lb.
3—INGERSOLL RAND Size AN, 500 lb.
6—INGERSOLL RAND Size BN, 1000 lb.
15—DETROIT 1 and 2-ton cap.
15—APPLETON Air Hose Reels, swivel base, 50' and 75' capacities.

## ELECTRIC HOISTS

1—DETROIT LHR, 5-ton capacity.
1—SHAW BOX 3-ton capacity.
1—P&H 5-ton capacity, Model LHR
1—COMET 1000 lb. capacity.
1—SHAW BOX 1000 lb. capacity.

## BUCKET ELEVATORS

1—LINK BELT 50' centers, 7" x 5" Buckets, 8" wide Belt.
1—LINK BELT 37' centers, 16" x 8" buckets, 20" wide belt, with Motor & Drive.
2—NATIONAL 45' centers, 10" x 7" Buckets 12" wide Belt, w/Motor & Drive.
1—LINK BELT 35' centers, 12" x 7" Buckets, with Motor & Drive.
2—LINK BELT 60' centers, 16" x 8" Buckets, with Motor & Drive.

## CUT-OFF MACHINES

1—DeWALT Model ME2 Cut-off Saw, 10 HP Motor, 24" Carboloy Blades.
1—GROB Band Saw, Type OS-36, open end, 36" throat. MD.
3—TESSEMER "I" Sprue Cutters.

## CORE WIRE STRAIGHTENERS

1—CLIMAX #3, ¼" to ⅜", 10" length.
2—KANE & ROACH Model DX-5.

## CORE GRINDERS

2—MILWAUKEE 70-12 Rotary type, 70" dia. table. Very Late.
1—STONEY Core Grinder, 16" dia. Wheel, 48" travel, 5 HP AC Motor.

## CORE BLOWERS

1—CHAMPION CB-18, max. core 125 lb.
2—CHAMPION CB-10, max. core 10 lb.
2—CHAMPION CB-400, max. core 300 lb.
1—DEMMLER No. 1, max. core 10 lb.
2—DEMMLER No. 2K, max. core 20 lb.
2—DEMMLER No. 2E, max. core 20 lb.
2—DEMMLER No. 2, max. core 20 lb.
2—DEMMLER No. 3, max. core 35 lb.
2—DEMMLER No. 3K, max. core 35 lb.
2—DEMMLER No. 3E, max. core 35 lb.
1—DEMMLER No. 4, max. core 100 lb.
1—DEMMLER No. 4E, max. core 100 lb.
2—INTERNATIONAL SB-11, max. core 15 lb.
2—INTERNATIONAL SB-13, max. core 30 lb.
2—OSBORN No. 192, max. core 50 lb.
2—OSBORN No. 193, max. core 75 lb.
6—MILWAUKEE-TACCONE A-3, max. cor 4 lb.
1—DEMMLER No. 50.
2—REDFORD No. 1 Bench type.
1—INTERNATIONAL SB-15H, with power core rollover.

## CORE KNOCKOUT SYSTEM

Consisting of: SIMPLICITY 3' x 8' Shakeout, 24" x 60' Belt beneath Shakeout, Inclined Belt 24" x 105' with 18" x 24" Dings Magnetic Pulley & MG Set, JEFFREY 24" x 20" Double Roll Crusher, and 25-ton cap. Storage Bin.

## CORE OVENS

4—CARL MAYER 2-Compartment Batch type, gas fired, recirculating, I.D. 7' W x 14' deep x 8' H, swing out doors.
1—GEHNRICH 18' W x 24' D x 9' H Oil fired, recirculating, with Cars.
1—INDUCTION Heating Dielectric, Model M-800A, 600 lb. per hr. New.
1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays, gas fired.
1—MAEHLER Single Compartment, I.D. 96" L x 80" W x 84" H, gas fired, recirculating, L&N Controls.
2—DIETERT #500 Lab Drying type.

## CUPOLAS, BLOWERS & ACCESSORIES

1—SPENCER—Turbo 150 HP Centrifugal, 7500 CFM, 48 oz.
1—ROOTS CONNERSVILLE Size 20 x 44, 7000 CFM, Type HD, 50 HP Motor.
4—LINDBERG Centrifugal Blowers, 2100 CFM, with 15 HP Motors.
5—WHITING 42" dia. Charging Buckets.
1—INGERSOLL RAND Single Stage FS-367, 100 HP, 9400 CFM.
2—WHITING #9 Cupolas, with I-R FS-357 Blowers, 50 HP Motor, New 1944.
2—INGERSOLL RAND FS-365 Turbo-Blowers, 50 HP Motor, 8150 CFM.

## DUST COLLECTORS & ROTO-CLONES

1—AMERICAN AIR FILTER #20 Type N Rotoclone, Arrangement C, w/Sludge Ejector.
1—AMERICAN AIR FILTER #14 Type W, Arrangement C, with Sludge Ejector.
1—AMERICAN AIR FILTER #27 Type W, Arrangement C, with Sludge Ejector.
2—AMERICAN AIR FILTER #10 Type N, with Bench, for grinding.
1—AMERICAN AIR FILTER #24 Type N, 24000 CFM, 75 HP Motor.
3—AMERICAN AIR FILTER #30 Type W, Arrangement C, with Sludge Ejector.

## ELECTRIC ARC MELTING

2—AJAX #500 Nose Tilt Furnaces, 3000 cycle—used with Induction MG Set.
1—AJAX #300 Nose Tilt Furnace, 3000 cycle—used with Induction MG Set.
2—DETROIT Rockers, indirect arc, Type AA 750-1000 lb. cap., w/200 KVA Transformers.
2—DETROIT Rockers, indirect arc, Type AA 1000-1500 lb. capacity, with 358 KVA Transformers.

## GAS & OIL FIRED FURNACES

2—LINDBERG FISHER MNP Size 300, electric tilt, with motor and blower.
6—LINDBERG FISHER MNP Size 1700, electric tilt, with motor and blower.
3—LINDBERG FISHER MNP Size 2400, electric tilt, with motor and blower.
2—LINDBERG FISHER Type BBI Size 225, hand tilt, with motor & blower.
12—LINDBERG FISHER Type SSH Size 550 stationary, with Motor & Blower.
6—LINDBERG FISHER Type SSH Size 150 stationary, with Motor & Blower.
3—LINDBERG FISHER Type SSH Size 60 stationary, with Motor & Blower.
2—CAMPBELL HAUSFELD IPNT Size 2000, electric tilt, w/Motor & Blower.
10—CAMPBELL HAUSFELD Stationary, Size 100-200, with Motor & Blower.
1—LINDBERG FISHER Type BBI Size 1000, hand tilt, gas fired.

## GRINDERS—SWING FRAME

1—MARSCHKE 12" x 2" wheel, 3 HP Motor.
1—MARSCHKE 20" x 10" wheel, 10 HP.
2—FOX No. 6, 24" x 10", 15 HP.
1—MARSCHKE 24" x 10" wheel, 15 HP.

## GRINDERS—SNAGGING

2—U.S. ELECTRICAL #64, 20" x 3" wheel, 7½ HP motor, 4-speed.
1—HAMMOND WR-1, 24" x 3" wheel, 10 HP.
2—SAFETY RITE #174, 24" x 3" wheel, 10 HP.
2—MARSCHKE Model LGZAH, 24" x 4" wheel, double end, 20 HP, multiple speed.

## GRINDERS—DISC

1—BEASLEY #372 Vertical Spindle Dry Grinder, 53" dia., 20 HP. New 1952.
1—QUEEN CITY Model 100 Double End, 20" x 2" wheel, 10 HP Motor.
1—U.S. ELECTRICAL #80 Double End, 16" x 3" wheel, with 7½ HP Motor.

## HEAT TREAT FURNACES

1—TOCCO JR. 20 KW Induction Heating Unit single station, 9600 cycles, with 40 HP Motor.
2—LINDBERG Model 4860-GH, gas fired, 48" x 60", recirculating, 1250° F.
1—LOFTUS Annealing Walking Beam type, gas fired, recirculating, 1600° F., 10' x 12' x 40'.

## LADLES

5—WHITING Cylindrical, 3000#, geared.
12—MODERN F-9 and FA-9 Pouring Devices, with 400 to 800 lb. ladles.
3—WHITING Cylindrical, 19" x 26", 275 lb. cap.
2—MODERN Cylindrical, 29 x 30, 1500 lb.
1—MODERN Mixing, 44" x 44", on wheels, 4000 lb. cap.
2—STEVENS Cylindrical, 29" x 41", 2450 lb. cap.
9—WHITING Lip Pour, 23" x 23", 1200 lb.
6—MODERN Lip Pour, 24" x 24", 1600 lb.
2—WHITING Lip Pour, 29" x 29", 2000 lb.
2—WHITING Lip Pour, 41" x 41", 7000 lb.
1—WHITING Lip Pour, 44" x 44", 8000 lb.
1—WHITING Lip Pour, 58" x 58", 10-ton.
1—WHITING Lip Pour, 40-ton capacity.
7—WHITING Bottom Pour, 48" x 48", 4-ton.
1—WHITING Lip Pour, 20-ton capacity.
1—MODERN Cylindrical Mixing, 3-ton cap. electric.

## MOLDING MACHINES JOLT SQUEEZERS

2—MILWAUKEE #104, 10" cyl., portable.
2—MILWAUKEE #123, 12" cyl., stat.
6—MILWAUKEE #181, 18" cyl., 24" x 36" table.
8—OSBORN #275-JW, 10" cyl., portable.
16—OSBORN #275-J, 10" cyl., portable.
3—OSBORN #276-J, 12" cyl., portable.
6—OSBORN #210-PJ, 10" cyl., stat.
6—OSBORN #212-PJ, 12" cyl., stat.
20—SPO #110-J, 10" cyl., portable.
6—TABOR 10" cyl., portable & stat.

## JOLT ROLLOVER PATTERN DRAW

1—JOHNSTON & JENNINGS #612-B, 24" x 30" table, 12" draw, 1000 lb. jolt cap.
1—DAVENPORT 28-SA, 29" x 40" table, 12" draw, 1500 lb. jolt cap.
1—DAVENPORT 34-SA, 34" x 48" table, 15" draw, 2500 lb. jolt cap.
2—DAVENPORT 40-SA, 42" x 50" table, 18" draw, 3000 lb. jolt cap.
1—HERMAN 6000 lb. Series, 42" x 78" table, 20" draw.
3—HERMAN Hi-Speed Jar, 1500 lb. series, 26" x 48" and 26" x 30" tables.
1—HERMAN 750 lb. Series, 20" x 30" table.
2—HERMAN 4000 lb. Series, 40" x 60" table, 13" jolt cyl.
6—INTERNATIONAL "R" Core Rollovers.
2—INTERNATIONAL "G" Size 20" x 8".
3—INTERNATIONAL "G" Size 24" x 10".
2—INTERNATIONAL "G" Size 30" x 12".
1—INTERNATIONAL RES Size 15" x 8".
4—JOHNSTON & JENNINGS #918, 44" x 54" table, 20" draw, 2000 lb. cap.
1—JOHNSTON & JENNINGS #815-B, 30" x 40" table, 15" draw, 1500 lb. jolt cap.
1—MILWAUKEE #167, 32" x 33" table, 12" draw, 1000 lb. jolt cap., 16" sq. cyl.
1—MILWAUKEE #217, 35" x 41" table, 16" sq. cyl., 12" draw, 1200 lb. jolt cap.

*WRITE FOR OUR COMPLETELY NEW CATALOG OF USED FOUNDRY EQUIPMENT.*

**AAA MACHINERY & EQUIPMENT CO.**

**15539 SARANAC ROAD — CLEVELAND 10, OHIO — CALL LI. 1-6545**

# AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

1—MILWAUKEE #60B-3, 60" flask, 18" draw.
10—OSBORN #40 and 42 Hand Core Rollovers, 18" x 8" draw.
1—OSBORN #442, 21" x 31" table, 10" draw 600 lb. jolt cap.
1—OSBORN #242W, 29" x 42" table, 19" draw, 1500 lb. jolt cap.
2—OSBORN #405, 57" x 64" table, 26" draw 3000 lb. jolt cap.
6—OSBORN #601, 30" wide flask, 10" draw, 750 lb. jolt cap.
6—OSBORN #602, 36" wide Flask, 10" draw, 750 lb. jolt cap.
1—SPO #413D, 24" x 25" table, 10" draw, 600 lb. jolt cap., 13" sq. cyl.
1—SPO #506, portable, 24" x 30" table, 10" draw, 600 lb. jolt cap.
3—TABOR 30" x 40" table, 12" draw, 1000 lb. jolt cap., stationary.
4—TABOR 22" x 32" table, 10" draw, 600 lb. jolt cap.

## JOLT PIN LIFT

1—OSBORN #561, 40" x 50" table, 12" draw 5000 lb. jolt cap.
1—OSBORN #560, 32" x 45" table, 12" draw, 2500 lb. jolt cap.
2—DAVENPORT 24-AJS, 24" x 30" table, 8" draw, 1000 lb. jolt cap.
2—MILWAUKEE #2542, 38" x 42" table, 12" draw, 3000 lb. jolt cap.
2—OSBORN #559, 25" x 30" table, 6" draw, 1200 lb. jolt cap.
1—OSBORN #563, 55" x 63" table, 12" draw, 7000 lb. jolt cap.
1—SPO #3058, 22" x 28" table, 8" draw, 750 lb. jolt cap.

## PIN LIFT

1—B&P Model AL2424 Jolt Speed Draw.
1—INTERNATIONAL LP-6, 8" draw, 750 lb. jolt cap.
1—INTERNATIONAL LP-10, 30" x 30" flask, 1000# cap.
2—MILWAUKEE #620-ND, 24" x 30" table, 2000 lb. cap.

## JOLT SQUEEZE PIN LIFT

1—MILWAUKEE #216, 21" cyl., with roll-on and roll-off attachments.
2—MILWAUKEE #165, 24" x 34" table, 8" draw, 16" sq. cyl.
1—MILWAUKEE #125, 21" x 27" table, 8" draw, 12" squeeze cyl.
1—OSBORN #716-PJ Stat., 22" x 34" table, 7" draw, 16" squeeze cyl.
1—OSBORN #712-V, 18" x 26" table, 12" squeeze cyl.
4—INTERNATIONAL PKL, 12" squeeze cyl., 6" draw.
2—OSBORN #710-J, 17" x 21" table, 10" squeeze cyl.
1—SPO #2114, 20" x 27" table, 4" draw, 600 lb. jolt cap., 11" cyl.
2—SPO #2136-G, 19" x 26" table, 6" draw, 13" cyl., portable.

## JOLT (BUMPERS)

1—HERMAN 40" x 60" table, 6000 lb. cap.
1—TABOR 30" x 40" table, 2800 lb. cap.
1—HERMAN 8' x 12' table, 10000 lb. cap.

## MATERIAL HANDLING EQUIPMENT

1—HAYWARD 1 cu. yd. Electric Clamshell Bucket, w/Sheppard Electric Hoist.
1—EC&M 45" dia. Type SA Electric Magnet, 115 volts DC.
3—HOUGH Model HA Payloader, hydraulic lift, 12 cu. ft. cap. bucket.
1—BLAW-KNOX ½ yd. Bucket, single line.

**CONVEYOR BELT—BUILT TO YOUR SPECIFICATIONS**

20", 24" and 30" wide, either flat or trough idlers, Timken bearings, take-ups, motors and speed reducers, any designated speed. All material used, with exception of steel. Can be supplied with hoppers and plows. Send us your Prints.

## STEEL APRON CONVEYOR

2—JEFFREY 48" x 12'
1—LINK BELT 48" x 200' Centers
1—NATIONAL ENG. 30" x 230' Centers.
1—NATIONAL ENG. 30" x 45' Centers.

## OSCILLATING CONVEYOR

2—LINK BELT 30" x 45'
1—LINK BELT 30" x 80'
1—LINK BELT 30" x 65'
1—LINK BELT Model PA 36" x 40' Oscillating Conveyor, with 5 HP Motor.
3—SIMPLICITY Model OA-10-A, 36" x 15'.
1—LINK BELT 48" x 154'.

## OVERHEAD HOPPER & STORAGE BINS

1—JEFFREY 60-ton Storage Bin
1—LINK BELT 100-ton Storage Bin
1—NATIONAL ENG. 12' x 14' Steel Sand Storage Hopper, 100-ton cap., bolted.

## ROLLER CONVEYOR

1500' MATHEWS 16", 24" & 30" wide Rollers, 2-9/16" dia., 3" & 4" center 11/16" hex shaft.
800' MATHEWS 22" Roller Conveyor, 2¼" dia on 6" centers, 4" channel iron.
200' MATHEWS 6" Roller Conveyor, 2½" dia. on 3" centers, 4" channel iron.

## UNDERCAR UNLOADER

6—FARQUHAR 18" x 30', with 3 HP Motors.
1—FARQUHAR 14" x 20' with 3 HP Motor.

## TRAMRAIL

6—LOUDEN MONORAIL Bridges, two 20' span, two 12' span, two 30' span, 1 and 2-ton capacity.
1—AMERICAN TRAMRAIL System, with one 1-ton 20' span Underslung Bridge and 150' of 12" tramrail, with air reels.
6—AMERICAN TRAMRAIL 2 and 4-ton 20' span Underslung Bridge Cranes, chain gear travel.

## OVERHEAD CRANES

1—WHITING 5-ton Overhead Crane, 50' span, cab operated, AC current.

## MOLD CONVEYOR

1—LINK BELT 36 cars 4' x 5', 190' Track, with automatic dump. New 1952.
3—LINK BELT 88 Cars 20" x 48", 350' track, with automatic dumping.

## SAND MULLERS

1—B&P #3½ Mulbaro, 350# batch.
1—B&P #7 Mulbaro, 700 lb. batch.
1—JEFFREY Type 1 Hammer Mill, Size 1548.
1—BEARDSLEY & PIPER #30 Speedmullor, 3 cu. ft. batch, w/20 HP Motor.
1—SIMPSON #0 Sand Muller, 3' pan dia., 175 lb. batch.
1—LINK BELT 48" x 8' Paddle Type.
1—BAKER PERKINS #16½, 30 HP Motor.
2—SIMPSON #1 Style B, 400 lb. Batch cap.
3—SIMPSON #3 Style C, 3000 lb. batch.
1—SIMPSON #2 Style C, 1500 lb. batch, enclosed gear, with Loader.
3—SIMPSON #3 Style UD, 3000 lb. batch, w/Cooling Hood & Exhauster.
1—DRAVO-DOYLE 6 cu. ft. cap. Wonder Model, portable, 5 HP 220/440 Motor.

## SAND PREPARATORS

2—NATIONAL #3 Style C Aerators, 60-ton per hr. cap.
6—ROYER Sand Conditioning Units, consisting of:
1—1' x 5' Royer Shakeout.
1—Farquhar 18" x 30' Conveyor.
1—Royer NDS Sand Preparator.
6—B&P Screenerators, Models S, M & L.
1—PEKAY Aerator, Model 320-3.
8—ROYERS, Models NDP, C-2, NC-4, NDS.

## SAND CUTTERS

1—AMERICAN Model AA, 5'2" Blade.
2—AMERICAN Model M, Size 79/60.
1—AMERICAN Model M, Size 99/80.
1—AMERICAN Model M, Size 89/70.
1—AMERICAN SandMaster, 72"/102".

## SANDSLINGERS

2—JEFFREY Swivel type Flask Filler Booms.
1—B&P Tractor type, 19" head, 13' arm.
1—B&P 16" Tractor type, 13' arm, magnetic tower, 4' ramming, 4" tip.
2—B&P Model 16S-DB Stationary type, 16" head.
2—B&P Swing type Slingers, 19" head.
1—B&P Stationary, double Belt, 4' impellor, 22" head, 5" tip, 50 HP.
2—B&P Model DB, stationary, 19" head, 4' impellor, 4" tip, 25 HP Motor.
3—Plate Feeders—7' dia. x 18' deep, 10 HP Motor & Reducer.

## SHAKEOUTS & SCREENS

1—SIMPLICITY 3' x 5' Model B, 5000# cap.
1—ROYER 30" x 5' Model ST, 5000# cap.
22—NATIONAL ENG. 1½-ton Moulders Hoppers air operated gates.
1—NATIONAL ENG. 5' x 8' Hexagon Revolving Tapered Screen, with Motor & Drive.
1—SIMPLICITY 3' x 8' Model BG, 5000 lb.
1—ROBBINS 8' x 10' Model JF-11 Dual, 16 ton per unit, w/two 20 HP Motors.
1—SIMPLICITY 4' x 10', Model D, 16000#.
1—HEWITT-ROBINS 36" x 78" Vibrex.
3—LINK BELT 5' x 10', heavy duty.
1—SIMPLICITY 6' x 8", Model DE, 16000#.
1—SIMPLICITY 4' x 10' Model B, single deck sifter screens, 10 HP Motors.

## TUMBLING BARRELS

2—SLY 42" x 72" Square, 10 HP Gearhead, w/built-in brake, Timken bearings.
2—SLY 36" x 84" Type C, 7½ HP Gearhead, w/built-in brake, Timken bearings.
4—WHITING 48" x 72", 10 HP Gearhead, w/built-in brake, Timken bearings.
1—SLY 48" x 96" w/Motor & Drive, mag. brake, Timken bearing.
1—SLY 72" x 120", w/Motor & ½ Drive, mag. brake, Timken bearing.
1—SLY 36" x 54" Type C Round, with 5 HP V-belt Drive.

## SAND BLAST EQUIPMENT

1—AMERICAN WHEELABRATOR 48" dia. Swing Table. New 1952.
2—AMERICAN WHEELABRATOR 36" Continuous Tumblasts. New 1951—Never Used.
1—AMERICAN 86" dia. Swing Table, with dust collector.
1—AMERICAN #3 Tablast, w/four 48" dia. auxiliary tables.
1—AMERICAN #1 Tablast, w/seven 14" dia. auxiliary tables.
1—AMERICAN 27" x 36" Tumblast, w/Skip Hoist, shot return and electrical.
1—AMERICAN 36" x 42" Tumblast, w/Skip Hoist, shot return and electrical.
1—AMERICAN 48" x 42" Tumblast, w/Skip Hoist, shot return and electrical.
1—HOLLINGSWORTH Model 44" x 48".
1—HYDRO-BLAST Cabinet, 40 HP Motor & Pump.
1—PANGBORN 9LF-14—9' dia. Plain Table w/two Roto-Blast units and CH-2 Dust Collector, 4850 CFM. New 1951.

## TESTING EQUIPMENT

1—G.E. KX-10 X-Ray, 140 KW, Industrial.

HINES Pop-off Flask—350 Assorted Sizes—all Copes and Drags, single and double pins. Send for Complete Listing!

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## AIR COMPRESSORS

COMPLETE STOCK—BURY, PENNSYLVANIA, SULLIVAN, INGERSOLL-RAND —SEND YOUR REQUIREMENTS

## BLOWERS

25—CENTRIFUGAL, 16 oz., 2 to 5 HP
10—GE, WILBRAHAM-GREEN, FISHER Positive Pressure and Cent. Cupola Blowers

## CLEANING EQUIPMENT

1—AMERICAN WHEELABRATOR TUMBLAST 1945, 48" x 72", with Skip Loader, Vert. bucket conveyor, motors & controls

1—AMERICAN WHEELABRATOR TUMBLAST, 48" x 48" w/loader used 9 Mos.
1—AMERICAN WHEELABRATOR TUMBLAST, 42" x 48" w/loader
1—AMERICAN WHEELABRATOR TUMBLAST 36" x 42" w/loader
1—PANGBORN TABLAST, 8' Table
1—PANGBORN ROTOBLAST, #BVR-5
1—PANGBORN ROTOBLAST, #28, Type GK
1—PANGBORN BLAST CABINET, #EP-5
3—TANNEWITZ METAL CUTTING BANDSAWS, 30" and 36"
1—CRESCENT METAL CUTTING BANDSAW, 30"
4—BURRING BENCHES, Magnesium cleaning, 9' L x 30" H x 30" W

## CONVEYORS

1—LINK BELT, vibrating, double deck, 80' x 24", w/exhaust hood
1—LINK BELT, Car type mold, 114 cars, 403' track, car size 18" x 42"
1—JEFFREY, 3 compartment, ingot mold
4—SAND ELEVATORS, Various sizes
6—SAND BELTS, 10' ctrs. to 140' ctrs.
2500 FEET—FOUNDRY TYPE ROLLER CONVEYOR—ALL SIZES

## CORE BLOWERS

2—DEMMLER #2, vert. or horiz.
1—DEMMLER #2A
1—DEMMLER #3K
1—DEMMLER #55, Late Model
1—DEMMLER #2K
1—OSBORN #92
2—OSBORN #192, #193
1—CHAMPION CB-12
1—CHAMPION, Model CB-400
1—INTERNATIONAL SB-13
1—OSBORN Core Rollover, #136-3, (NEVER USED)

## CUPOLAS

2—WHITING #5 complete with Skip Charger and Blower
1—MORRIS #9, Skip charger, Blower, Mixing Ladle, Never Installed
1—SKIP CHARGER for #9 Cupola with scale and buckets
1—WHITING #4 with skip charger, Motor and Blower

## DUST COLLECTORS

4—ROTOCLONE, #12, Type N, wet type
1—ROTOCLONE #14D w/Filter
1—ROTOCLONE, 16W
2—ROTOCLONE, Size 20D, Hopper type F
1—ROTOCLONE, Type W, 30" w/precleaner
1—PANGBORN, Style 635, 7800 CFM, 15 HP
1—AMERICAN DUSTUBE, #45 Bag Type

## FLASKS

150 HINES AND FREEMAN ALUMINUM, Popoffs and Jackets
200 TRANSITE CORE PLATES, Various Sizes
SEND US YOUR REQUIREMENTS

## FURNACES—DIRECT ARC MELTING

1—3,000 #/hr. LECTROMELT 23,000 V
1—3 ton/Hr. "LECTROMELT", Top Charge
1—6 Ton/hr. HEROULT

## FURNACES—INDIRECT ARC

1—350 #/hr. DETROIT, Complete
1—1500 # DETROIT ROCKER, Complete

## FURNACES—INDUCTION MELTING

2—333 KW, AJAX-TAMA-WYATT, 1500 # Alum., 60 cycle
1—30 KW, LEPEL
1—20 KW, AJAX SPARK GAP, High Frequency
1—6 KW AJAX
1—3 KW, AJAX, Lab type
1—75KW Induction Melting Furnace complete with 200 lb. Furnace.
1—30 KW Induction Melting Furnace with 100 lb. Furnace.

**SANTA'S XMAS GIFT TO YOU**

*Specially Priced For December*

**MELTING UNIT**

2—#5 Whiting Cupolas with automatic monorail charger, with Foxboro controls and blower, discharging into a Whiting Air Furnace.
This Melting Unit is in Excellent Condition!

*Operated Only 2 Years*

## FURNACES—GAS & OIL

1—FISHER MNP, Gas, Tilting, 1700 # cap. Mag.
2—FISHER, Gas, Stationary, 4 Burner, 500 # cap.
1—FISHER MNP, Oil, Tilting, with blower. 500 # cap. Alum.
1—FISHER MNP, Oil, with blower, 1500 # cap. Brass
3—FISHER, Oil, Stationary, model 125, type S, Brass
1—DEMPSEY, Reverberatory, 10,000 #, 9' W x 14' L x 9' H, Oil
1—HAUSFELD, Tilting, 1200 # capacity
1—HAUSFELD, Gas, Stationary, 1000 #
1—HAUSFELD, Gas, Stationary, 70-80 # Alum.
1—CAMPBELL-HAUSFELD, Gas, 100-125 Crucible
1—SKLENAR, Oil, 600 # Cap.
1—STROMAN, Gas, Tilting, 1,000 # cap. Alum, auto control hyd. lift
1—REDA 550 #. Never Used
1—CAMPBELL-HAUSFELD, Gas, 200-250 # brass, Crucible with Gas Burner

## MOLDING MACHINES

### Jolt Rollovers

1—J & J #920RC
2—J & J #918
1—J & J #815, 30" x 40", 15" draw, 1200 # jolt
2—INTERNATIONAL, 13 x 17" table, 6" draw
1—HERMAN 10,000 #, 48" x 109" table
1—HERMAN 6000 #, 42 x 78"
1—HERMAN 3000 #, 30" x 66" Table
2—HERMAN 1500 #
1—HERMAN 750 #, 30" x 36"
1—OSBORN, 712 PJ, 18 x 28"
1—OSBORN #602, 36" x 26"
2—OSBORN #405-86, with leveling carriage
1—OSBORN # 405, 3,000 #, flask size 64" x 50", 18" draw
1—OSBORN #333
1—OSBORN #332
2—OSBORN #243, 28 x 40", 20" draw
4—OSBORN #142, 15" x 20", hand draw
4—TABOR, 40 x 60", 2000 & 3000 # capacity
1—TABOR, 30" x 40" with air clamps
3—TABOR 22" x 42", pattern draw, shockless, portable
1—TABOR, 20 x 30" w/air clamps, 1000 #
2—TABOR, 14" x 16" Rockover
1—SPO ROCKOVER #506

### Bumpers

1—OSBORN #102
2—DAVENPORT, 30" x 30" table
1—DAVENPORT, 24" x 27" table

### Jolt Strippers

1—J & J, 30" x 24" table, 600 # cap.
2—SPO #305, 20" x 27" table, 750 # cap.
1—HERMAN, 22" x 30" table, #4317
1—TABOR, 20" x 20" table, hand strip
1—MILWAUKEE #1536, 32" x 38"
1—INTERNATIONAL 1255 PKL
1—OSBORN #559
2—SPO, #2160
2—OSBORN, #712PJ, Stationary
1—TABOR, 17" x 20" table, portable

### Jolt Squeeze Strippers

1—OSBORN #175, 21" x 18", portable
2—MILWAUKEE #163

### Jolt Squeezers

2—MILWAUKEE #105JS, 17 x 21", portable
6—SPO #110J, Portable
3—OSBORN #276-J, Cantilever
7—OSBORN #275-J, Portable
6—OSBORN #275PJ, Stationary
2—INTERNATIONAL, #12 LJS
6—TABOR, 3" Jolt, 17 x 20"
4—INTERNATIONAL, #10 LJS
1—MILWAUKEE, #126, 21" x 27" portable
2—NICHOLS, #12 F-P, portable

## MULLERS AND MIXERS

1—SIMPSON #0, 3' Dia., 1½ to 1¾ cu. ft.
1—B & P SPEEDMULLER, #30, 3'10" dia., 3 cu. ft.
1—CLEARFIELD, #920, 9' Dia., 25-30 cu. ft.
4—BAKER PERKINS, #4A

## LADLES AND POURING DEVICES

MODERN, SWINDELL, WHITING, TREADWELL—All Types and Sizes—Ready for your Needs!

## OVENS

1—COLEMAN, OIL, one compartment, recirc., 60" W x 80" H x 14' 6" L
2—ROSS, Gas, 2 compartment, recirc., rack type, 6½" x 14' x 7'
1—YOUNG BROS. elec., 3 compartment, Kiln type
3—GENRICH, elec., 3 drawer, preheating, auto-control, 9' H x 8' W x 6'7" L

## SAND CONDITIONING

3—B & P SCREENERATORS Model L, M and S
1—ROYER PREPARATOR, Comb. Model RC, 40 Ton/hr. Scrap removal, 9' x 9' hopper
3—ROYER, NB-2, 12" Belt
1—JEFFREY SANDITIONER, PORTABLE

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**1630 N. Ninth St., Reading, Pa.** **Phone 3-5103**

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**SPENCER FOUNDRY DIVISION**

PARK and FIRST STREETS

**WILLIAMSPORT, PENNSYLVANIA**

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**ONE OF THE EAST'S LARGER PRODUCTION FOUNDRIES.**

**OVER 200,000 SQUARE FEET FILLED WITH GOOD FOUNDRY EQUIPMENT**

**Everything must be sold! The building must be prepared for other uses as quickly as possible!**

The following is a partial list of the thousands of items offered for sale—Send for our more complete list or better yet come over and see for yourself!

2—Whiting #10 Cupolas; 2—Whiting #9 Cupolas; 2—14000 C.F.M. 40 oz. Cupola Blowers; 3—Simpson #3 Mullers; 1—B. & P. #70 Muller; 1—B. & P. #60 Muller; 3—Mold Conveyors, 1 with 48″ x 84″ cars; 3—Synchronous Air Compressors up to 300 H. P.; 30—Molders hopper system; 28—Molding Machines, Nichols, Milwaukee, Osborn, Davenport; 2—40 H.P. Slingers; 2—25 H.P. Slingers; 2—Slinger Turntables 24′; 6—Shakeouts; 30—Air Hoists; 6—Core Grinders; 2—Fox Single Wheel Grinders; 10—Core Blowers; 4—Wheelabrators; 5—Tumbling Barrels; Laboratory Equipment; Complete Pattern Shop.

Ladles, 200 ton flasks, air tools, yard switching engine, monorails, trolleys, bridge cranes, core plates, chaplets, foundry supplies and alloys, thousands of feet of flat and troughing sand belt conveyors, thousands of feet roller conveyors, and other items too numerous to mention.

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*Circle 865 on Inquiry Card—Page 217*



***Imported from Germany, specifically designed to cut filing and grinding costs . . .***

## Filing Machine and Band Grinding Machine

**featuring**

**INFINITELY**

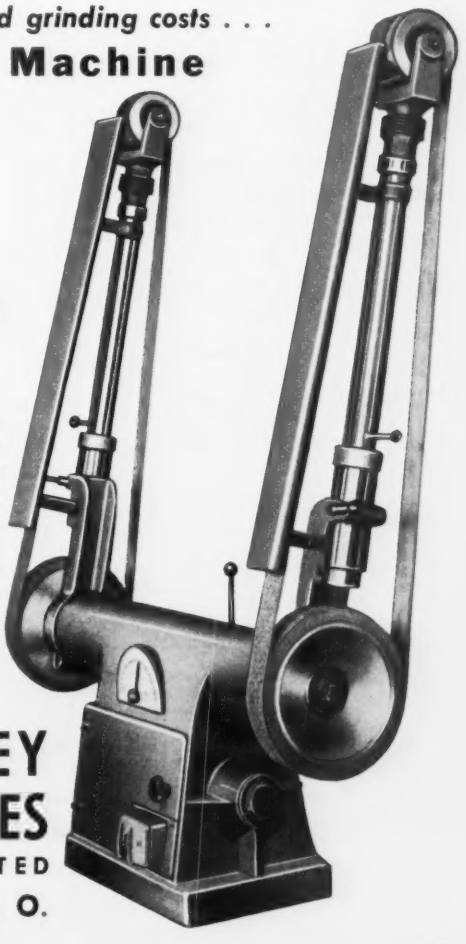
**VARIABLE**

**SPEED**

**TRANSMISSION**

★

The filing machine at left is an efficient and economical tool for roughing and smoothing any type of casting, iron, steel, or nonferrous. The band grinding machine at right grinds and polishes by means of contact discs and grinding bands. Both machines have infinitely variable speed transmission. This is an import deal. Ask us about it.



## HINCKLEY INDUSTRIES

INCORPORATED

**BOX 241 BRUNSWICK, O.**

*Circle 713 on Inquiry Card—Page 217*

1000-lb. hoist places cylinder head on engine.
No burned-out motors to stall production.

# KELLER TOOL AIR HOISTS

## *make handling easy as it looks*

Speed your handling jobs . . . in assembly, foundries, machine shops, shipping rooms — wherever dependable, controlled raising and lowering are needed.

### *CHECK THESE FEATURES BEFORE YOU BUY ANY HOIST*

- **NO BURN-OUT** from overload or stalling.
- **LOW MAINTENANCE** — rugged piston-type motor unaffected by dust or fumes.
- **ECONOMICAL**—uses much less air than other hoists of same capacity.
- **CONTROLLED SPEED**—from creep to maximum.

| Model | Capacity | Speed | Weight |
|---|---|---|---|
| 86-2V20 | 2000 lb. | 19 f.p.m. | 78 lb. |
| 86-2V20L* | 2000 lb. | 19 f.p.m. | 78 lb. |
| 86-2V10 | 1000 lb. | 35 f.p.m. | 78 lb. |
| 86-1V10 | 1000 lb. | 19 f.p.m. | 28 lb. |
| 86-1V10L* | 1000 lb. | 19 f.p.m. | 28 lb. |
| 86-1V5A | 500 lb. | 35 f.p.m. | 28 lb. |
| 86-1V3 | 300 lb. | 80 f.p.m. | 28 lb. |

** Models with link chain*

**BULLETIN 86** gives specifications and data on attachments.

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**KELLER TOOL division, Grand Haven, Michigan**

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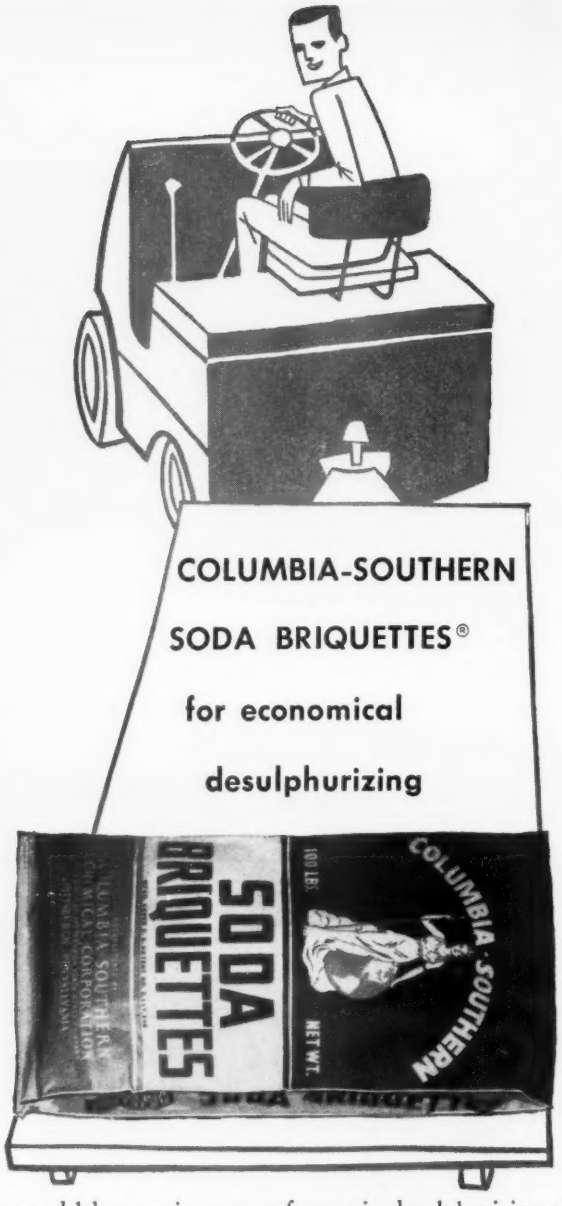


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- Stock-line indicators control stock level in cupolas . . .
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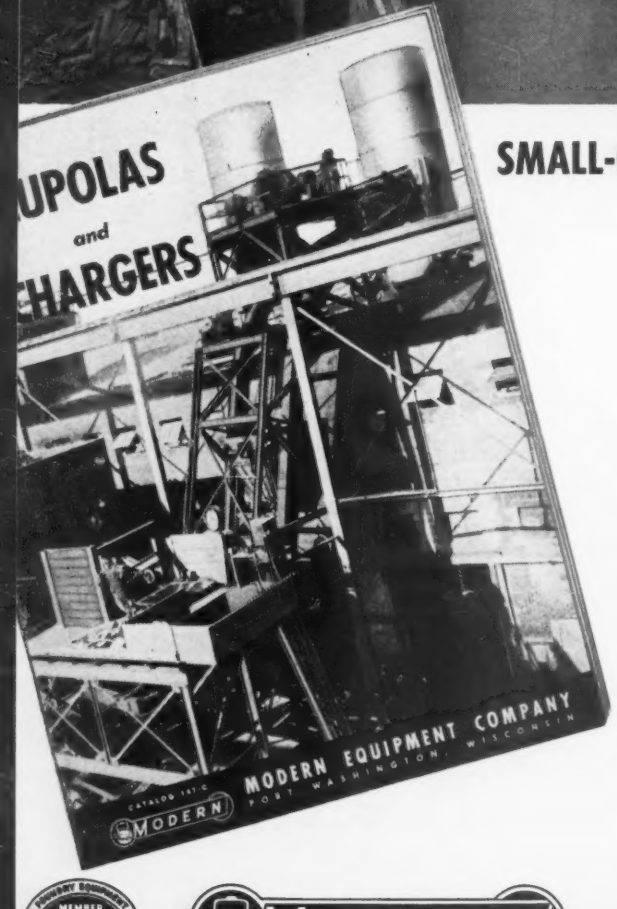
This and many other AUTOMIZED installations for foundries large and small are described in the new, 36 page, cupola-charger catalog as offered here. Use the coupon or your foundry letterhead . .

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- ☐ Mail catalog on ladles and pouring devices, P-152-A.
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- Stevens Fastick Liquid Core Paste
- Stevens Slick-Seal Mudding Compound
- Stevens Kast Kleen Compound
- Stevens Steveco, $CO_2$ Binder
- Stevens Ignicoat X and S Core Coatings

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Circle 552 on Inquiry Card—Page 217

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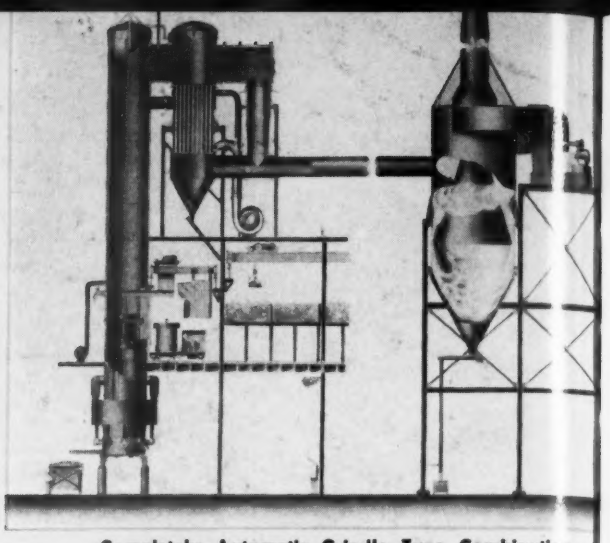

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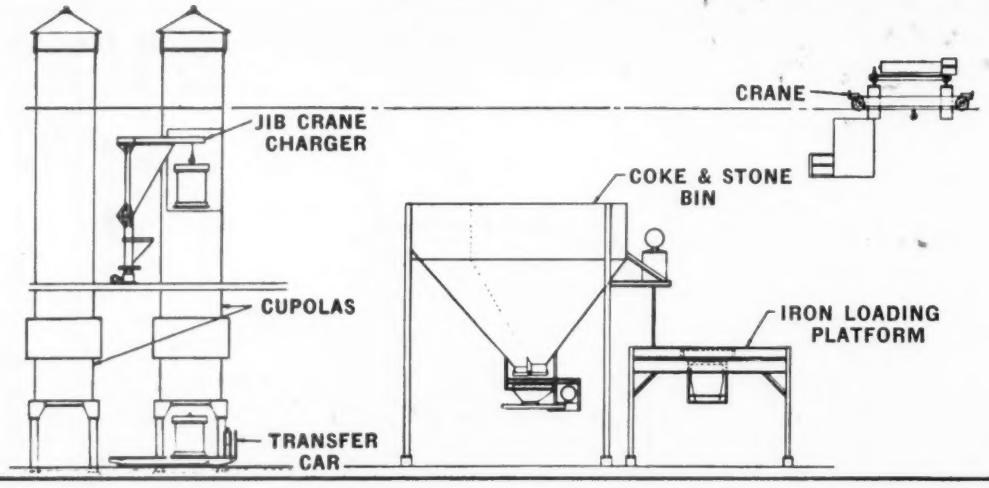
**to serve all needs of the Foundry Industry from metal receiving yard to the shipment of finished castings**

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*Foundrymen Who Know — Buy Bartlett-Snow*

# FOUNDRY

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The Penton Publishing Company
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Cleveland 13, Ohio

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